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JAPANESE PRODUCTIVITY: LESSONS FOR AMERICA

HEARING

BEFORE THE

SUBCOMMITTEE ON INTERNATIONAL TRADE, FINANCE, AND SECURITY ECONOMICS

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

NINETY-SEVENTH CONGRESS

FIRST SESSION

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JAPANESE PRODUCTIVITY: LESSONS FOR AMERICA

WEDNESDAY, NOVEMBER 4, 1981

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON INTERNATIONAL TRADE,
FINANCE, AND SECURITY ECONOMICS
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m., in room 2318, Rayburn House Office Building, Hon. Frederick W. Richmond (member of the subcommittee) presiding.

Present: Representatives Long, Richmond, and Rousselot.

Also present: Chris Frenze, Kent H. Hughes, Marian Malashevich, Douglas N. Ross, and Fred Soldwedel, professional staff members.

OPENING STATEMENT OF REPRESENTATIVE RICHMOND, PRESIDING

Representative RICHMOND. Good morning, ladies and gentlemen. This is a hearing of the Subcommittee on International Trade, Finance, and Security Economics of the Joint Economic Committee. We are delighted to have the subcommittee chairman present, Representative Long, who stopped in to greet us this morning.

Representative LONG. Thank you, Congressman. I'm optimistic about the way you'll handle these hearings from the interest you've shown and the time you've spent on Japan in really getting to the bottom of the problem. I think there's a great deal we can learn. My congratulations.

Representative RICHMOND. And, Mr. Chairman, I also want to thank you for allowing me to chair these hearings which I know will be interesting, and I hope they are, to the American public.

Last August, the American Productivity Center, under the very able direction of C. Jackson Grayson, invited a number of academics, businessmen, and policymakers to make a firsthand assessment of why Japanese productivity has grown so rapidly.

They showed us the very best of Japanese manufacturing. We visited the much publicized Datsun plant that is a marvel of plant design and efficiency. Material handling is kept to a minimum as automated equipment moves and welds parts. There appeared to be more robots than employees on the factory floor. The Japanese strength in steel and autos is a familiar story. But we should also be prepared for a similar display of industrial progress in the manufacture of robots, computers, and a wide variety of machined parts.

Although we saw the most advanced examples of Japan's manufacturing prowess, figures suggest how productivity growth has been broadly spread throughout the manufacturing sector. In industry af-

ter industry, Japan has recorded yearly double-digit productivity gains both before and after the oil shock of 1973. Japan has already become more productive than we are in a number of industries and, if present trends continue, will pass the United States in overall productivity sometime in the early 1990's.

Manufacturing, however, is not the entire Japanese story. In fact, the overall Japanese productivity level is less than 60 percent of what it is in the United States. Part of the problem lies in the notoriously inefficient Japanese distribution system. With thousands of small shops and many layers of middlemen, the Japanese distribution system adds to the cost of all goods and also acts as a barrier to potential foreign competition.

Agriculture is the other part of the Japanese miracle that needs some further work. A glance at the chart on my right is a sharp reminder of the burden Japanese agriculture imposes on the average Japanese consumer. Despite the billions of dollars of direct Government subsidies to agriculture, it takes the average Japanese more than 9 hours of work to pay for the same bag of groceries an American could carry home with less than 2½ hours on the job.

Even with the problems in agriculture and services, the Japanese have done so well in manufacturing that the overall rate of productivity remained high compared to other countries. In fact, except for Germany in the 1973–78 period, Japan has shown the most rapid productivity growth of any industrial country. And that brings us to the subjects of today's hearings, "How have the Japanese done it?" and "Are there some lessons that can be applied to the American economy?"

There were at least five points that struck me:

First, the Japanese have gone well beyond the process of installing the best piece of equipment as it became available. Entire factories are designed to minimize material handling, speed the flow of processed goods, and reduce the use of labor. That kind of approach requires topflight engineering to design quality plants and adequate capital to build them.

Second, the Japanese work to design quality into their products. Quality control is not a matter of randomly checking a finished product, but rather of working to eliminate faults all through the manufacturing process.

Third, labor and management share a commitment to the efficient workings of the firm. In the broadest sense of the word, Japan has built its industry with an extensive profit-sharing approach to labor relations.

Fourth, Japanese firms work to bridge the gap between managers and labor. There are fewer layers of management, there are no executive dining rooms or reserved parking places and managers wear the same company uniform as their blue-collar colleagues.

Fifth, the Japanese have built their industrial policy around a broadly shared consensus that to prosper they must continue to move their economy from unsophisticated, labor-intensive products toward the technology-intensive end of the spectrum. In practice, that has meant a willingness to move resources from industries that have lost their international competitiveness to ones that will soon achieve it.

Quality, investment, cooperation, and a shared vision of the future seem to me to be the four pillars of the Japanese success story.

Because the American Productivity Center trip was so rich in experiences, I have asked four other members of that delegation to share their thinking with the subcommittee. We have two of the very best thinkers in the administration with us this morning—Assistant Secretary of State for Economic and Business Affairs, Robert Hormats; and Roger Porter, the Special Assistant to the President for Policy Development and Counselor to the Secretary of the Treasury; and except for an unavoidable conflict, we would have had a third top-notch expert on Japanese affairs, the current Deputy Secretary of Commerce, Joseph Wright.

We are also pleased and honored to have with us Mr. Richard Cyert, president of Carnegie-Mellon University; and Mr. David LeVine, senior vice president of Martin Marietta Corp. Mr. Cyert's perception of how an economy works and his broad understanding of economics left us all with a greater understanding of Japan. I even told the staff of the Joint Economic Committee that he almost made me wish that I had become an economist instead of a politician. David LeVine is one of the sharpest minds in American business today and will, I am sure, point to what changes we should make in industry itself.

Chairman Long, do you have an opening statement?

Representative LONG. No statement, Representative Richmond.

Representative RICHMOND. Before we have the first witness come forward, I would like to request that the opening statements of Representative Rousselot and Senator Hawkins be included in the record.

[The opening statements of Hon. John H. Rousselot and Hon. Paula Hawkins follow:]

OPENING STATEMENT OF REPRESENTATIVE ROUSSELOT

The primary goal of economic policy must be to restore America's productivity growth.

This task is as difficult as it is important. The results of many years of wrong-directioned policies cannot be reversed overnight. The President's program for economic revitalization is a major step in the right direction.

We know that a productivity increase involves both improving the working effectiveness of people and creating new capital and technology. In other words, the private sector must play a major part in meeting the productivity challenge, for example, in adopting new management and motivation techniques. And, the government must remove tax biases favoring consumption and continue progress toward encouraging saving, investment, and economic growth.

Productivity improvement is a job for us all. Thank you.

OPENING STATEMENT OF SENATOR HAWKINS

A growing, increasingly efficient economy is absolutely essential to meet America's obligations at home and abroad. Productivity improvement—the keystone to economic growth—is essential for sustained, stable economic improvement.

My main conclusion from the many meetings and observations on the "productivity mission" to Japan is that Government policy can in fact influence savings and investment and thus encourage productivity growth. It can do so through incentives to savings and investment (as well as by reversing policies which encourage consumption over saving) and through intelligently-formed regulatory policies.

Both the private sector and the public have considerable roles in improving productivity and economic growth. The private sector is the engine of economic

growth. The parts of that engine—labor and business—must work strongly and harmoniously together or the engine cannot function to its full potential. While discussions on quality control circles are often informative, still the responsibility for productivity improvement through their use lies squarely with labor and business.

Government's role, however, limited, is important. We can hold hearings and conferences and so alert the American public to the importance of improving productivity, and we can focus attention on ways to do it. For example, some regulatory policies add far more to the costs of doing business than they bring back in benefits.

In July, I chaired a hearing on Japanese and American economic policies and U.S. productivity at which Mr. Charles A. Bradford, steel industry analyst and vice president of Merrill Lynch noted that in Japan, environmental quality regulations:

". . . Tend to be tougher than in the United States, but they are also easier to meet because modern equipment has been built with pollution control in mind and when you try to retrofit pollution control equipment on an old steel mill it tends to be . . . more expensive and not as efficient . . . ."

In other words, it is possible to achieve regulatory goals without crippling the ability of the economy to compete or cutting productivity growth.

I was very impressed at the seeming ability of the Japanese, at least in some industry areas, to meet both economic and regulatory goals. In the health and safety area, for example, economic growth can lead to betterment in the broadest sense, growth and higher productivity do not have to be at the expense of human health, as some would have us believe.

I want to share with you an excerpt from a statement made to our productivity mission by Takashi Ishihara, president of Nissan Motor Co. Ltd.:

"As a result of strenuous efforts centering on automation, our company's production volume has increased 80 percent and labor productivity has improved 50 percent, with manhours necessary for production of a vehicle reduced by 45 percent over the past 10 years.

"In the meantime, the automation and robotization have relieved workers from tiresome and tedious jobs . . . in turn, the workers have been able to concentrate on intellectual and high-level jobs . . . in short . . . we have accomplished two goals. One is the 'improvement of productivity and quality', and the other 'creation of better working conditions' by introducing robots and automated equipment in such places as stamping, body assembly and paint shops where working conditions were poor."

Again, that says to me that it is possible to intelligently meet important regulatory goals while at the same time encouraging industrial innovation and productivity.

In addition to providing information government has a direct role in promoting productivity. Working with our President, Congress can, and has, moved to change tax laws and incentives to economic activity so as to better encourage new saving and investment-based growth.

Let me share some of the findings from both our hearings and the productivity mission:

According to the American Chamber of Commerce in Japan, the Japanese Government assists the savings process tremendously in that interest on savings deposits with any financial institution up to about $14,350 is exempt from income tax for each individual. In addition to this, interest on savings deposits with the post office up to about $14,350 is also exempt from income tax. Further, an individual through his employer, may earn tax free interest on savings up to about $23,925. Thus interest on approximately $52,600 is tax free for each individual. The post office deposits, in particular, allow flexibility, liquidity and stability through term of deposits—6 months to 2 years and ability to withdraw deposits.

Employers can subsidize both interest paid by an employee on a house provided the employee pays at least 3 percent and the purchase of a house, provided the employee pays 50 percent of the market value. The employee pays no tax.

Generally, there are no taxes on capital gains. An individual is tax exempt unless there is: A sale of 200,000 or more shares in a single company during a taxable year; a sale of 200,000 or more shares (yen 50 par value) in 50 or more transactions during a taxable year; a sale of a major interest in a controlled corporation.

Accelerated write-offs are allowed in many instances. For example, 27 percent initial depreciation is allowed on qualified plant and equipment used for prevention of air and sea pollution, sewage disposal, smoke disposal and prevention of noise.

There are many other special incentives offered, such as investment tax credits for industrial reconversion equipment and tax credits for research and development expense. The point is that the Japanese Government has encouraged new capital formation and productivity growth in numerous ways.

The result has been that, over time, Japanese productivity has increased. For example, since 1950, Japan has multiplied its productivity four times as rapidly as the United States. (Japanese output per person employed rose from about 15 percent in 1950 to roughly 65 percent by the late 1970's.)

It is clear that improved productivity requires both labor and business working together more effectively and new capital formation. I do not advocate the wholesale adoption of Japanese policies. But I do think we can profit from their experiences. Thank you.

Representative RICHMOND. Good morning, gentlemen. Mr. Hormats, would you like to begin? I have already introduced you. You know we think the world of you. It's a constant pleasure to have you with us, Mr. Hormats.

STATEMENT OF HON. ROBERT D. HORMATS, ASSISTANT SECRETARY FOR ECONOMIC AND BUSINESS AFFAIRS, DEPARTMENT OF STATE

Mr. HORMATS. Thank you very much. I'll keep my statement very brief because I figure I probably will learn more than I am able to convey at this hearing, given the expertise here, but I would like to make a few general comments with respect to the general question of productivity and particularly the question of productivity in Japan.

I think we all were struck in our discussions in Japan, and in the time we have had to reflect on them, by the uniqueness of the Japanese enterprise and those elements of it which are transferable. It struck me that there were a number of points that fall into the latter category, and I would just like to touch on them very briefly.

It struck me in particular that the points——

Representative RICHMOND. Excuse me, Mr. Hormats. You have a full prepared statement?

Mr. HORMATS. I have a full prepared statement which I will submit, but I won't trouble you by reading the whole thing.

Representative RICHMOND. It's no trouble at all, but your entire statement will certainly appear in our record.

Mr. HORMATS. Thank you. Basically, I would like to draw a few broad conclusions: First, one of the big problems we have had in terms of labor productivity in the United States is the lack of investment needed to give workers, in effect, the capital with which to boost their productivity. That, I think, is perhaps one of the key elements, and I know Mr. Porter is going to discuss this point a little bit more so I won't dwell on it, but I think investment, having the capital resources to go with labor, is an essential matter.

Second, R. & D. and particularly basic research. The U.S. growth rate in that area has lagged very far behind that of many other countries, including Japan and a number of countries of Western Europe. I believe that really is the second underlying problem: These countries have attached a great deal of attention over the last several years—indeed, in the last 20 years or so—to building up an R. & D. capacity

which enables them to undertake the sort of innovative changes that they have made.

Now with respect to Japan, there's one very interesting point, and that is, that the Japanese have done very little original innovation or research. They have done a lot in terms of improving the process of production and in terms of innovating based on research that has been done elsewhere, particularly in the United States.

One interesting challenge to Japan over the next several years is whether they can move into original technology, original R. & D. work, to a greater degree than they have. The MITI vision of the future, which I was just reading on the way up here and which you have probably read, Mr. Chairman, is fascinating in that it deliberately points up the necessity, if Japan is going to continue its phenomenal growth rate, to do more research. One of the interesting debates in Japan concerns whether they can actually achieve that objective or whether they have to base their continued growth on adopting technologies which have been developed in other parts of the world, particularly the United States.

Two other points I would simply touch on. One, the question of the energy crisis and how it has affected the productivity.

Representative LONG. Mr. Hormats, may I ask you a question? On the basic issue of their adopting the technology of other areas, it's always impressed me not so much that they were able to take this technology and apply it, but rather that they had the ability or the structure that enables them to recognize it. Then, second, how is it that we failed to move in the direction of doing this?

How much of the problem results from the adversary relationship between business and labor? How much of it relates back to the old Joe McCarthy days of fear of even considering long-range planning on the part of the Government and a willingness to move in that direction? Tell me a little bit about that, would you? That's something that has just fascinated me as to our inability to do that when you have Japan's and, of a lesser extent, Germany's ability to do these things.

Mr. HORMATS. I think that's a very good point, that they have been able to move rapidly, adopt innovation, and take these things and put them in the production process quickly. There are reasons for this.

One, business-labor relations don't have the tradition of, shall we say, competition or friction between unions and management. There are strikes, but they are essentially pro forma strikes. There's not the history of labor unions—in fact, Japan was told after World War II they had to have labor unions. They accepted labor unions. They didn't have to earn their role in the Japanese economy as they had to do here. As a result, you don't have the friction and tension between the two.

Second, I talked with one Japanese manager with respect to the question of introduction of new technology, particularly robotics, and he made two interesting points. One, we had the robotics in the United States before they did. We just didn't know how to adopt them as rapidly or as effectively to our own production process. The Japanese, when they got these robots, decided they were going to do it, but they used the technicians in the plants themselves to do that adaptation rather than people who know a lot about robots. They

took people who knew a lot about making cars, and they were the ones that adapted them to the production line.

Second, they introduced them very gradually. They didn't introduce them all at once. They introduced them where the work in the plant was least pleasant, shall we say, painting and spraying, which is something workers find difficult to do because the paint in some cases gets in their lungs, and it's unhealthy. What they have done is use robots for that and for heavy riveting, which is very noisy and unpleasant.

Representative RICHMOND. And welding?

Mr. HORMATS. Yes, the jobs that are not particularly pleasant to do. So they moved them into the plant rather gradually and gained a certain degree of acceptability.

In addition, they have in some cases personalized them and given them names, and that has made the worker a little bit more fond of the machinery.

In addition, there's a great deal more security in a Japanese plant so that there's less fear of new technology. Can you imagine trying to put some of these things into effect in a place like Britain where workers are so totally insecure about their jobs that they would resist violently any attempt to introduce this new technology?

So I think the Japanese have done some very unique things in this area, and in part it's because, as you correctly point out, the labor-management relationship is somewhat different.

Let me just touch on two additional points. One is the question of energy. I think it's quite clear from the studies that I've seen at least, that a portion of what's happened in terms of technology sluggishness in this country—or R. & D. sluggishness—is due to a very massive adjustment to the higher oil prices. This has forced firms to cast away machinery, even some of it relatively new, in order to put into place new and more energy-efficient machinery. This has meant that a lot of new investment has taken place not so much to produce more products but to produce the same products with less energy, more efficiently. That investment has, in effect, led to the sort of productivity improvements we would get if you got new investment which enabled workers to produce more goods for the same unit of labor. But it has not helped labor productivity; it has helped energy productivity. One of the very interesting aspects of our economy is the dramatic progress the United States has made in improving energy productivity.

We tend to look at labor productivity. In the United States, energy productivity has advanced quite dramatically. I think that's a plus and certainly it has helped reduce oil imports.

The last point I want to make is on safety, health, and environmental regulations. The United States has placed great emphasis on these for overriding social reasons for the last several years. I think it's quite clear that these regulations have had an effect on productivity and have contributed to a degree to a slower rate of measured productivity increase than would otherwise have taken place.

The converse argument is that, while this has happened, it has contributed to the longer-term productivity in labor. However, it takes a lot of time for that effect to be realized. It cuts down accidents on the job and, over a 20- or 30-year period, it will mean less black lung disease and less difficulty in terms of the overall health of the labor

force. However, at least in the near term, these things have had a dampening effect on the measured increase in productivity. The fact that we have made a lot of progress in this area means I think, that in the next several years, we needn't devote the same share of our GNP to these sorts of things as we did in the last decade. I think that will, to a degree, also help to enhance labor productivity.

Well, I've gone through the basic points I wanted to make. Why don't I just stop now and be ready for questions.

[The prepared statement of Mr. Hormats follows:]

Prepared Statement of Hon. Robert D. Hormats

Mr. Chairman:

I am very happy to be able to be here to discuss U.S. productivity performance. I will try today to put the productivity issue in an international context by pointing out the relevance of our productivity performance to our relationships with other countries, by comparing our performance to some of our major competitors, and by asking whether we can learn anything from these countries, most of which had substantially better gains in the past decade than we have had.

The United States entered the post-war era with a substantial lead in productivity--reflecting the size of our capital stock, our advanced technology, our high quality labor force, and our superior management. Our trading partners were devastated physically, but drew on their great reserve of human capital and domestic and foreign resources and technology to rebuild their societies. It was thus inevitable that the productivity gap would narrow.

IN FACT, THE PACE OF PRODUCTIVITY GROWTH IN A NUMBER OF COUNTRIES HAS INCREASED AT A GREATER RATE THAN OUR OWN. AS THIS HAS OCCURRED, U.S. INDUSTRY HAS HAD TO FACE AN INCREASINGLY COMPETITIVE WORLD.

IN RECENT YEARS, HOWEVER, IT APPEARS THAT WE HAVE ALSO CONTRIBUTED TO A WEAKENING OF OUR RELATIVE POSITION AS OUR OWN RATE OF PRODUCTIVITY GROWTH HAS SLOWED SHARPLY. THERE HAVE NO DOUBT BEEN MANY REASONS FOR THIS--SOME OF WHICH I WILL SUGGEST LATER. BUT THE BOTTOM LINE IS THAT WE ARE NOW IN THE EARLY PART OF A DECADE IN WHICH OUR CUSHION HAS DISAPPEARED, AND WHERE OTHER COUNTRIES ARE THREATENING TO TAKE THE LEAD IN SOME AREAS WHERE WE HAVE BEEN DOMINANT. THUS OUR CURRENT EFFORTS TO REVIVE OUR PRODUCTIVITY PERFORMANCE ARE COMING NONE TOO SOON. OUR SUCCESS IN MEETING THE CHALLENGES OF VIGOROUS INTERNATIONAL COMPETITION WILL BE A CENTRAL FACTOR IN OUR INTERNATIONAL ECONOMIC RELATIONS IN THE 1980's.

SIMPLY PUT, AN INCREASE IN PRODUCTIVITY OF A GIVEN IMPUT MEANS OBTAINING MORE (OR HIGHER QUALITY) OUTPUT PER UNIT FROM THAT IMPUT. THERE ARE SEVERAL SOURCES OF PRODUCTIVITY GAINS. INCREASING THE QUANTITIES OF OTHER FACTORS--E.G., INCREASING THE CAPITAL/LABOR RATIO NORMALLY INCREASES LABOR PRODUCTIVITY. CHANGES IN THE QUALITY OF OTHER INPUTS CAN ACHIEVE THE SAME GOAL--FINDING A RICHER

VEIN OF ORE PERMITS GREATER PRODUCTION OF METAL PER LABOR-HOUR, UNIT OF CAPITAL, OR BTU USED TO SMELT THE ORE. CHANGES IN THE QUALITY OF THE FACTOR CONCERNED CAN INCREASE ITS PRODUCTIVITY--MORE EDUCATION, FOR EXAMPLE, GENERALLY INCREASES LABOR PRODUCTIVITY. CHANGES IN TECHNOLOGY MAY PERMIT NEW, LESS COSTLY, COMBINATIONS OF FACTOR INPUTS TO BE USED IN THE PRODUCTION PROCESS. MORE EFFECTIVE MANAGEMENT CAN GREATLY INCREASE PRODUCTIVITY BY INCREASING EFFICIENCY AND MOTIVATION OF OUR LABOR FORCE.

INCREASED LABOR PRODUCTIVITY IS THE PRINCIPAL (AND ONLY SUSTAINABLE) AVENUE THROUGH WHICH A COUNTRY'S STANDARD OF LIVING CAN BE RAISED. (THE ALTERNATIVES FOR A COUNTRY INCLUDE MAINLY INCREASING LABOR INPUTS--E.G., MORE OF THE POPULATION IN THE LABOR FORCE OR MORE HOURS PER WEEK WORKED.)

PRODUCTIVITY INCREASES ARE ALSO AN IMPORTANT ANTIDOTE TO INFLATION AS COSTS ARE DIRECTLY REDUCED. WITHOUT PRODUCTIVITY GAINS, MOREOVER, WORKERS' ASPIRATIONS FOR IMPROVING STANDARDS OF LIVING CAN ONLY BE MET AT THE EXPENSE OF OTHER GROUPS IN THE ECONOMY, AND THE RESULTING STRUGGLE FOR INCOME SHARES CAN EXACERBATE INFLATION.

REDUCED INFLATION AND INCREASED POTENTIAL FOR SUSTAINABLE GROWTH--THE FRUITS OF PRODUCTIVITY INCREASES--ARE IMPORTANT FROM AN INTERNATIONAL PERSPECTIVE. CLEARLY, OUR ABILITY TO

DEVOTE THE NECESSARY RESOURCES TO DEFENDING OUR SECURITY POSITION MUST REST ON A VIGOROUS ECONOMY.

DECLINE IN U.S. PRODUCTIVITY GROWTH

IN THE AGGREGATE, LABOR PRODUCTIVITY IN THE UNITED STATES HAS GROWN AT A DECREASING RATE OVER THE LAST 35 YEARS. THERE HAS BEEN A MARKED FALL IN THAT GROWTH RATE SINCE 1973: BETWEEN 1960 AND 1973, PRODUCTIVITY GROWTH PER MAN-HOUR WAS ABOUT 3.0 PERCENT; SINCE THAT DATE, THE RATE OF GROWTH HAS BEEN 1.7 PERCENT, A FALL OF ABOUT HALF. THESE AGGREGATE NUMBERS MASK CONSIDERABLE DIFFERENCES BY INDUSTRY; THOSE INDUSTRIES THAT ARE EXPANDING MOST RAPIDLY SHOW FAR GREATER LABOR PRODUCTIVITY GAINS THAN DO STAGNATING INDUSTRIES.

THERE ARE SEVERAL EXPLANATIONS ADVANCED FOR THIS SLOWDOWN: FAILURE OF GROWTH OF CAPITAL STOCK TO KEEP UP WITH A RAPIDLY EXPANDING LABOR FORCE; INCREASINGLY BURDENSOME GOVERNMENT REGULATIONS WHICH DIVERTED R&D, INVESTMENT, AND MANAGERIAL RESOURCES AWAY FROM OUTPUT INCREASING ACTIVITIES; AND SLOWER ADVANCES IN EDUCATION AND TECHNOLOGY.

ONE OF THE MAJOR REASONS THAT LABOR PRODUCTIVITY GROWTH HAS SLOWED IN RECENT YEARS IS THE INCREASED EFFORT TO IMPROVE ENERGY PRODUCTIVITY IN THE UNITED STATES FOLLOWING THE 1973 OIL-PRICE SHOCK. WITH THE INCREASE IN THE COST OF ENERGY

RELATIVE TO OTHER FACTORS OF PRODUCTION, FIRMS BEGAN TO SERIOUSLY CONSERVE THE INCREASINGLY MORE EXPENSIVE INPUT.

GREAT STRIDES HAVE BEEN MADE IN REDUCING THE ENERGY/OUTPUT RATIO. WE HAVE REDUCED THE AVERAGE ENERGY INPUT PER DOLLAR OF REAL GNP BY ABOUT 20 PERCENT SINCE 1975. OUR IMPORTS OF OIL HAVE DECLINED BY ABOUT 25 PERCENT SINCE THE TIME OF THE FIRST OIL-PRICE SHOCK, DESPITE THE RISE IN REAL OUTPUT IN THIS COUNTRY.

STUDIES ON THIS SUBJECT INDICATE THAT, IF THE RELATIVE PRICE OF ENERGY HAD NOT RISEN SINCE 1973, LABOR PRODUCTIVITY GAINS IN THE UNITED STATES WOULD HAVE BEEN 0.18 PERCENTAGE POINTS GREATER THAN THE 1.70 PERCENT GAINS WHICH HAVE ACTUALLY BEEN REALIZED. IN OTHER WORDS, LABOR PRODUCTIVITY GAINS WOULD HAVE BEEN ABOUT 10 PERCENT HIGHER IN THE ABSENCE OF INCREASES IN THE RELATIVE PRICE OF OIL.

OVER THE LAST DECADE, THERE HAS ALSO BEEN CONSIDERABLE INVESTMENT IN POLLUTION-ABATEMENT FACILITIES. IT HAS BEEN ESTIMATED THAT, BETWEEN 1973 AND 1978, ABOUT ONE-THIRD OF THE NET INVESTMENT IN MANUFACTURING WAS FOR POLLUTION-ABATEMENT EQUIPMENT. CRITICS OF ENVIRONMENTAL REGULATIONS ARGUE THAT INVESTMENT IN POLLUTION CONTROL IS NOT PRODUCTIVITY-INCREASING--AND THAT, IN FACT, IT IS MADE AT THE COST OF OTHER INVESTMENT THAT WOULD INCREASE LABOR PRODUCTIVITY. ON THE OTHER HAND,

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PROPONENTS OF ANTI-POLLUTION, HEALTH, AND SAFETY REGULATIONS ARGUE THAT A HEALTHIER EMPLOYEE, LESS PRONE TO ON-THE-JOB INJURY, IS MORE PRODUCTIVE THAN ONE WHO LABORS IN A POLLUTED OR UNSAFE WORKPLACE. BECAUSE ENVIRONMENTALLY-CAUSED DISEASES TAKE MANY YEARS TO DEVELOP, THE HEALTH BENEFITS OF REDUCING POLLUTION MAY TAKE SEVERAL YEARS TO BE REFLECTED IN PRODUCTIVITY STATISTICS.

OVER THE COURSE OF THE LAST DECADE, WE HAVE MADE GREAT STRIDES IN REDUCING THE POLLUTION OF OUR LAND, AIR AND WATER AND IN REMOVING HAZARDS FROM OUR WORK ENVIRONMENT. HENCE, WE CAN PROBABLY CONTINUE TO MAKE MEANINGFUL PROGRESS ON THE POLLUTION-CONTROL AND SAFETY FRONTS WHILE DEVOTING A SMALLER PORTION OF OUR TOTAL INVESTMENT DOLLARS TO ENVIRONMENTAL ENDS, A PROSPECT WHICH LEAVES A LARGER PORTION OF OUR NEW INVESTMENT TO BE DEVOTED DIRECTLY AND MORE IMMEDIATELY TO INCREASING LABOR PRODUCTIVITY OR FURTHER REDUCING THE FUEL REQUIREMENTS OF THE U.S. ECONOMY.

THIS ADMINISTRATION'S APPROACH TO REGULATIONS--REMOVING OR REDUCING THOSE THAT ARE UNDULY BURDENSOME AND SEEKING THE LEAST-COSTLY MEANS OF ACHIEVING A DESIRED OBJECTIVE--WILL FREE STILL MORE RESOURCES FOR INVESTMENTS WHICH INCREASE PRODUCTIVITY.

Measurement of Productivity

It must be noted that there are some problems associated with the measurement of labor productivity, which tend to reduce the measured rate of productivity increase in the economy. On the one hand, the United States is a mature economy, where service industries are growing much more rapidly than manufacturing and extractive industries. It is inherently more difficult to measure the output of a service industry than of a manufacturing or extracting company. Also, they are labor-intensive, so that the shift of output toward the service sector tends to reduce overall productivity. Moreover, in some sectors of the economy, in government, for example, labor productivity is <u>assumed</u> not to be changing over time, despite the introduction of labor-saving machinery in offices.

Another procedure which tends to bias measured productivity change downward is the fact that productivity per labor-hour is frequently calculated on the basis of hours <u>paid</u> rather than of hours actually <u>worked</u>. Because of this quirk in the figures, an increase in paid holidays or vacation time will, other things equal, cause measured productivity to fall--even though the employee's output per hour spent on the job does not change. This procedure may be appropriate to the measurement of unit labor costs, but, in view of the increased demand for

LEISURE AMONG WORKERS TODAY, IT TENDS TO UNDERSTATE THE EXTENT TO WHICH PEOPLE'S PRODUCTIVITY INCREASES DURING THE TIME THEY ARE ACTUALLY ON THE JOB.

OVERALL, THE UNITED STATES ECONOMY PROBABLY STILL POSSESSES THE HIGHEST ABSOLUTE LEVEL OF LABOR PRODUCTIVITY IN THE WORLD. (ONE RECENT STUDY SUGGESTS WE MAY HAVE FALLEN BEHIND.) IN ANY CASE, OVER THE LAST 15 YEARS OR SO, OTHER COUNTRIES, JAPAN AND WEST GERMANY, NOTABLY, HAVE BEEN CLOSING THE GAP BY ACHIEVING GREATER GAINS IN LABOR PRODUCTIVITY. THE U.S. HAS CHALKED-UP A 1.7 PERCENT AVERAGE INCREASE IN PRODUCTIVITY PER YEAR. JAPAN HAS LED THE LEAGUE WITH A 7.2 PERCENT INCREASE. FRANCE, WEST GERMANY, BELGIUM, AND THE NETHERLANDS HAVE SEEN GAINS OF 4.8-6.6 PERCENT EACH YEAR ON THE AVERAGE. EVEN ITALY'S PRODUCTIVITY INCREASED 3.5 PERCENT PER YEAR. ONLY THE UNITED KINGDOM, WITH A RATE OF PRODUCTIVITY ADVANCE OF 1.4 PERCENT PER YEAR, FELL BELOW THE UNITED STATES.

INVESTMENT

ONE REASON FOR STRONG PRODUCTION GAINS ABROAD IS INVESTMENT. IN TERMS OF PERCENTAGE OF GNP, OUR COMPETITORS ARE GREATLY OUT-DISTANCING THE UNITED STATES IN INVESTMENT. DURING THE 1970'S INVESTMENT WAS 25 PERCENT HIGHER IN GERMANY AND MORE THAN TWO-THIRDS HIGHER IN JAPAN (RELATIVE TO GNP) THAN IN THE UNITED STATES. AS A RESULT, THE AVERAGE AGE OF PLANT AND EQUIPMENT IN THE UNITED STATES IS 16-17 YEARS WHILE IT IS 12 YEARS IN WEST GERMANY AND 10 YEARS IN JAPAN. NEW PLANT AND EQUIPMENT IS MORE LIKELY TO INCORPORATE LABOR AND/OR RAW-MATERIAL SAVING TECHNOLOGY THAN IS OLD CAPITAL STOCK.

A RECENT STUDY OF JAPANESE INDUSTRY FOUND THAT ANNUAL STEEL OUTPUT PER WORKER IN JAPAN IS NOW ABOUT TWICE WHAT IT IS IN THE UNITED STATES AND THAT THE AVERAGE JAPANESE AUTOWORKER PRODUCES 3 MORE CARS PER YEAR THAN DOES HIS AMERICAN COUNTERPART. THE JAPANESE ARE SIMPLY EMPLOYING MORE ADVANCED TECHNOLOGY IN THESE INDUSTRIES THAN WE ARE.

LAST YEAR, NEARLY 60 PERCENT OF JAPANESE STEEL WAS PRODUCED BY THE VERY EFFICIENT CONTINUOUS CASTING PROCESS, BUT ONLY 20 PERCENT OF U.S. STEEL WAS PRODUCED THROUGH CONTINUOUS CASTING. THE JAPANESE HAVE EMPLOYED ROBOTS TO PERFORM ROUTINE MONOTONOUS ASSEMBLY-LINE TASKS TO A FAR GREATER EXTENT THAN HAS AMERICAN INDUSTRY. CLEARLY, IF U.S. INDUSTRY WISHES TO COMPETE INTERNATIONALLY, IT MUST CONTINUE TO MODERNIZE. FAILURE TO DO SO MAY EVEN COST IT THE HOME MARKET.

RESEARCH AND DEVELOPMENT

RESEARCH AND DEVELOPMENT (R&D) SPENDING LEADS TO THE OUTWARD MOVEMENT OF THE TECHNOLOGY FRONTIER AND PERMITS INCREASES IN PRODUCTIVITY. IN THIS VITAL AREA, THE UNITED STATES LAGS BOTH GERMANY AND JAPAN. CIVILIAN R&D SPENDING AS A PROPORTION OF GNP IN THIS COUNTRY HAS BEEN ABOUT 2/3 THAT IN GERMANY FOR THE PAST 15 YEARS; DATA FROM THE MID-SEVENTIES SHOW A SIMILAR RELATIONSHIP WITH RESPECT TO JAPAN.

FURTHER, IT IS BASIC RESEARCH IN WHICH THE FRONTIERS OF KNOWLEDGE ARE EXPLORED AND EXPANDED. YET, UNTIL RECENTLY, RESOURCES IN THE UNITED STATES HAVE BEEN SHIFTED OUT OF THIS VITAL FIELD TOWARD APPLIED RESEARCH AND DEVELOPMENT. A RECENT STUDY INDICATES THAT, BETWEEN 1967 AND 1977, THE PROPORTION OF R&D SPENDING IN THIS COUNTRY DEVOTED TO BASIC RESEARCH FELL BY 25 PERCENT. THE SAME STUDY REVEALED THAT, HOLDING APPLIED RESEARCH AND DEVELOPMENT SPENDING CONSTANT, THERE IS A DIRECT AND STATISTICALLY-SIGNIFICANT RELATIONSHIP BETWEEN SPENDING ON BASIC RESEARCH AND GAINS IN TOTAL FACTOR PRODUCTIVITY.

MANY FOREIGN COUNTRIES, AMONG THEM, FRANCE, WEST GERMANY, JAPAN, CANADA, AND THE UNITED KINGDOM, HAVE VARIOUS TAX OR SUBSIDY PROGRAMS DESIGNED TO STIMULATE RESEARCH-AND-DEVELOPMENT-RELATED INVESTMENT -- EITHER IN GENERAL OR IN PARTICULAR INDUSTRIES SUCH AS COMPUTERS AND AEROSPACE.

SEVERAL ECONOMIC STUDIES HAVE SHOWN THAT THE RATES OF RETURN ON INVESTMENT IN RESEARCH AND DEVELOPMENT ARE VERY HIGH -- IN DOUBLE OR TRIPLE FIGURES DEPENDING ON THE INDUSTRY OR SECTOR. IN VIEW OF SUCH FINDINGS, ONE IS TEMPTED TO ASK WHY ANY GOVERNMENTAL ROLE SHOULD BE REQUIRED TO ENCOURAGE R&D. ESSENTIALLY, THE ANSWER HAS THREE PARTS: A. R&D IS AN INHERENTLY RISKY BUSINESS. A FIRM NEVER KNOWS WHETHER ANYTHING USEFUL WILL COME OF ITS EFFORTS IN THE AREA. MOREOVER, THE NEW PRODUCTS OR TECHNOLOGY ARISING FROM COMPANY "A's" RESEARCH MAY ULTIMATELY BE MORE BENEFICIAL TO COMPANY "B"; B. R&D MUST BE VIEWED AS A LONG-TERM PROCESS. EVEN

IF A FIRM DOES EVENTUALLY RECEIVE A LARGE POSITIVE RETURN ON ITS INVESTMENT, THAT RETURN MAY NOT MATERIALIZE FOR SEVERAL YEARS; AND, C. THE SOCIAL RETURN TO R&D IS OFTEN MUCH GREATER THAN THE BENEFITS ACCURING TO THE FIRM UNDERTAKING THE RESEARCH AND DEVELOPMENT. FOR EXAMPLE, THE ADVANCES IN ELECTRONICS THAT HAVE OCCURRED SINCE THE INTRODUCTION OF THE TRANSISTOR HAVE HAD APPLICATIONS IN INDUSTRIES (LET ALONE FIRMS) OTHER THAN THOSE IN WHICH THE INVENTION WAS FIRST SYNTHESIZED. IN THESE CASES, PART -- BUT BY NO MEANS ALL -- OF THE RETURN TO SOCIETY ARISING FROM THE R&D INVESTMENT ACCURED TO THE INVESTING COMPANY.

GRANTED THAT A PUBLIC ROLE IN R&D IS ECONOMICALLY JUSTIFIED, THE NEXT QUESTION CONCERNS THE NATURE OF THE ROLE THE FEDERAL GOVERNMENT SHOULD PLAY IN THE PROCESS. MOST FOREIGN ECONOMIES, INCLUDING THOSE OF THE INDUSTRIAL NATIONS, RECEIVE SUBSTANTIALLY MORE GUIDANCE OR DIRECTION FROM GOVERNMENT THAN DOES OURS. IN THE UNITED STATES, WE TEND TO BELIEVE THAT, GIVEN A FAVORABLE ECONOMIC CLIMATE, THE PRIVATE BUSINESSMAN KNOWS BEST WHERE TO ALLOCATE HIS RESOURCES. HENCE, THE ADMINISTRATION'S PROGRAM TO STIMULATE R&D IS CONCERNED IN LARGE MEASURE WITH ESTABLISHING THAT CONDUCIVE ECONOMIC MILIEU.

THE ADMINISTRATION HAS BEGUN TO REMOVE UNNCESSARY REGULATIONS WHICH HAVE FETTERED OUR INDUSTRIES IN THE RECENT PAST AND TO MAKE THE REMAINING NECESSARY REGULATIONS MORE

RATIONAL AND LESS ONEROUS. IN DOING SO, WE ARE FREEING RESOURCES, THE EFFORTS OF RESEARCHERS AND SCIENTISTS, AS WELL AS CAPITAL, TO TURN TO THE TASK OF EXPANDING MAN'S FIELD OF KNOWLEDGE AND DEVISING PRACTICAL APPLICATIONS OF WHAT HE ALREADY KNOWS.

IN ADDITON TO THE INCENTIVES TO INVESTMENT IN GENERAL CONTAINED IN THE NEW TAX LAW--WHICH WILL BE OF MAJOR IMPORTANCE--THERE ARE SPECIAL INDUCEMENTS TO UNDERTAKE R&D RELATED INVESTMENT. MACHINERY AND EQUIPMENT USED IN RESEARCH AND DEVELOPMENT CAN BE DEPRECIATED OVER A THREE-YEAR, RATHER THAN A FIVE-YEAR, PERIOD. THE NEW LAW PROVIDES A TAX CREDIT FOR 25 PERCENT OF THE INCREMENTAL SPENDING ON THE WAGES AND SALARIES OF RESEARCHERS AND ON THE LEASING OF COMPUTERS AND SOME LABORATORY SUPPLIES TO BE USED IN RESEARCH AND DEVELOPMENT.

TODAY, ADVANCES IN TECHNICAL KNOW-HOW SPREAD AROUND THE WORLD QUICKLY, REDUCING COSTS AND RAISING LIVING STANDARDS WORLDWIDE. THE DIFFUSION OF TECHNICAL KNOWLEDGE HAS INCREASED WITH THE RISE OF MULTINATIONAL FIRMS WHICH USE THE TECHNICAL ADVANCES DEVELOPED IN ONE OF THEIR FACILITIES IN THEIR OPERATIONS AROUND THE WORLD. FURTHER, THE INTERNATIONAL LICENSING OF PATENTS ALLOWS PRODUCERS AND CONSUMERS IN ALL COUNTRIES TO BENEFIT FROM NEW DISCOVERIES AND INVENTIONS WHEREVER THEY OCCUR. FREQUENTLY, ONE NEW TECHNIQUE OR INVENTION BUILDS UPON ANOTHER SO THAT THE INTERNATIONAL DIFFUSION OF KNOWLEDGE FACILITATES FURTHER TECHNOLOGICAL ADVANCE.

THIS PROCESS HAS TWO IMPORTANT IMPLICATIONS FOR THE U.S.: FIRST, WE MUST INTENSIFY OUR EFFORTS IF WE ARE TO STAY AHEAD IN THE TECHNOLOGICAL RACE. SECOND, WE MUST BE OPEN AND FLEXIBLE IN ABSORBING ADVANCES ORIGINATING ELSEWHERE, JUST AS OTHERS HAVE ADAPTED TO OUR INNOVATIONS.

THE U.S. HAS DEPENDED HEAVILY ON TECHNOLOGY FOR ITS INTERNATIONAL COMPETITIVENESS. U.S. EXPORTS OF TECHNOLOGY-INTENSIVE MANUFACTURERS GREW IN IMPORTANCE RELATIVE TO EXPORTS OF NON-TECHNOLOGY-INTENSIVE MANUFACTURERS BETWEEN 1962 AND 1977. BY THE END OF THAT PERIOD, HIGH-TECHNOLOGY GOODS ACCOUNTED FOR MORE THAN 48 PERCENT OF OUR EXPORTS OF MANUFACTURES COMPARED TO 38 PERCENT AT THE BEGINNING.

WHAT'S HAPPENING NOW IN THE PRIVATE SECTOR

INVESTMENT IN NEW MACHINERY PERMITS A MANUFACTURER TO EQUIP HIS FACILITY WITH STATE-OF-THE-ART TECHNOLOGY. HOWEVER, INVESTMENT IN RESEARCH AND DEVELOPMENT PERMITS THE STATE-OF-THE-ART TO BE IMPROVED, TO EMBODY GREATER TOTAL FACTOR PRODUCTIVITY. IN THE R&D AREA, IT IS COMMITMENT TO BASIC RESEARCH WHICH IS MOST CRUCIAL SINCE, BY ITS VERY NATURE, BASIC RESEARCH INVOLVES EXPANDING KNOWLEDGE ITSELF.

UNFORTUNATELY, THE PAYOFF TO BASIC RESEARCH IS LONG-TERM IN NATURE AND EXTREMELY UNCERTAIN. HOWEVER, MORE AND MORE

COMPANIES ARE COMING TO REALIZE ITS IMPORTANCE. THIS YEAR, PRIVATE FIRMS ARE SUPPORTING $200 MILLION WORTH OF BASIC RESEARCH ON THE NATION'S CAMPUSES.

TOP MANAGERS AT SOME COMPANIES ARE TAKING AN ACTIVE INTEREST IN ESTABLISHING CLOSE WORKING RELATIONSHIPS WITH SCIENTIFIC AND TECHNICAL STAFF. THESE MANAGERS ARE STRIVING TO CREATE AN ATMOSPHERE WHICH IS CONDUCIVE TO CREATIVE RESEARCH WORK. SOME FIRMS ARE PERMITTING SCIENTISTS TO SPEND SOME TIME ON THEIR OWN PROJECTS.

LABOR/MANAGEMENT RELATIONS

THERE ARE ALSO CHANGES IN MANAGEMENT PROCEDURES AND ORGANIZATIONAL ARRANGEMENTS WHICH CAN YIELD QUICK AND SUBSTANTIAL RETURNS TO THE FIRM. COMPANIES WHICH HAVE ADOPTED A "STRATEGIC OPERATIONS POLICY," WHEREBY THE IMPORTANCE OF DAY-TO-DAY SHOP-FLOOR DECISIONS TO THE WELL-BEING OF THE FIRM AND ITS EMPLOYEES IS RECOGNIZED AND EACH WORKER IS HELD RESPONSIBLE FOR THE QUALITY OF HIS OWN WORK, CAN HAVE DRAMATIC IMPACTS ON PRODUCTIVITY AND COSTS IN THE COMPARATIVELY SHORT RUN. THIS TYPE OF PRACTICE IS FREQUENTLY FOUND IN JAPANESE INDUSTRY. SUCH A MANAGEMENT APPROACH REDUCED DEFECTS, REDUCES COSTS, AND REDUCES THE NEED OF AFTER-SALE SERVICE. THE CUT IN NECESSARY AFTER-SALE SERVICE TENDS TO IMPROVE THE REPUTATION OF THE COMPANY AND LEAD TO MORE SALES IN THE FUTURE.

IN JAPAN, WHERE THE WORKER APPEARS TO FEEL VERY RESPONSIBLE FOR THE QUALITY OF HIS WORK AND THE ECONOMIC FORTUNES OF HIS COMPANY, A SURVEY OF 453 FIRMS WITH 1.8 MILLION WORKERS SHOWED THAT THE AVERAGE WORKER MADE 12.8 SUGGESTIONS IN 1980, UP 80 PERCENT FROM THE ONE YEAR-EARLIER LEVEL. ABOUT HALF OF THESE SUGGESTIONS WERE ADOPTED BY MANAGEMENT. SINCE THE AVERAGE BONUS PAID PER SUGGESTION WAS ABOUT $2, IT IS HARDLY LIKELY THAT THE PROSPECT OF IMMEDIATE FINANCIAL REWARD MOTIVATED WORKERS TO RECOMMEND CHANGES IN THE WAY THEIR COMPANIES ARE RUN. IN THE UNITED STATES, A SURVEY OF 219 CORPORATIONS SHOWED THAT, IN 1979, THE AVERAGE WAS ONLY ONE SUGGESTION FOR EVERY SEVEN EMPLOYEES ON WAYS TO IMPROVE EFFICIENCY. IF THESE SAMPLES ARE GUIDES, EACH AMERICAN WORKER MADE ABOUT 1 PERCENT AS MANY SUGGESTIONS AS DID EACH JAPANESE WORKER.

THE RESULTS OF ADOPTING A STRATEGIC OPERATIONS MANAGEMENT POLICY CAN BE QUITE SIGNIFICANT IN THE AREAS OF COSTS, OUTPUT, AND PROFITS.

FOR EXAMPLE, THE HOME REFRIGERATION DIVISION OF TOKYO SANYO ELECTRIC CUT: WAREHOUSE SPACE REQUIREMENTS BY 75 PERCENT, INVENTORY REQUIREMENTS BY 85 PERCENT, AND LOT SIZES BY 40 PERCENT WITHIN FIVE YEARS WHILE TRIPLING THE VOLUNE OF PRODUCTION, AND NEARLY TRIPLING THE NUMBER OF MODELS.

WITHIN FOUR YEARS, THE PROFITS OF THE DIVISION HAD INCREASED MORE THAN SIX-FOLD. IN THIS COUNTRY, GENERAL ELECTRIC, HEWLETT-PACKARD, AND SIGNETICS HAVE BENEFITTED FROM ADOPTING SUCH A "STRATEGIC OPERATIONS POLICY."

AS I NOTED, THE JAPANESE HAVE LED THE PRODUCTIVITY-GROWTH LEAGUE FOR THE LAST SEVERAL YEARS. PART OF THE EXPLANATION LIES IN THE PERCENTAGES OF GNP THEY DEVOTE TO INVESTMENT. HOWEVER, AGGREGATE INVESTMENT IS NOT THE ONLY FACTOR WHICH MAKES JAPAN SO PRODUCTIVE AND SO COMPETITIVE INTERNATIONALLY.

ALL OF US ARE AWARE OF THE CHALLENGE POSED BY JAPAN. IN EARLIER YEARS, THE WORDS "MADE IN JAPAN" WERE A SYNONYM FOR SHODDY WORKMANSHIP. TODAY, THE OPPOSITE IS THE CASE; FACED WITH INCREASING COMPETITION FROM THE NIC'S (NEWLY-INDUSTRIALIZING COUNTRIES) LIKE TAIWAN, HONG KONG, KOREA AND SINGAPORE, JAPANESE INDUSTRY HAS STRIVEN: A) TO PLAN AHEAD TO DEVELOP THE INDUSTRIES WHOSE PRODUCTS WILL BE IN DEMAND SEVERAL YEARS FROM NOW; B) TO GRADUALLY PHASE OUT OLD INDUSTRIES IN WHICH THE COUNTRY NO LONGER HAS A COMPARATIVE ADVANTAGE; AND C) TO INNOVATE--TO ADOPT THE MOST COST-EFFECTIVE MEANS OF PRODUCTION AVAILABLE WITH TODAY'S TECHNOLOGY.

MUCH OF THIS THRUST COMES FROM INSTITUTIONAL FACTORS WHICH HAVE DEVELOPED AS THE RESULT OF THE UNIQUE SOCIO-

ECONOMIC FABRIC WHICH BINDS THAT ENTITY TOGETHER. FIRST OF ALL, JAPANESE MANAGERS IN U.S. FACTORIES HAVE POINTED OUT THAT THE JAPANESE WORK FORCE IS ON THE AVERAGE VERY WELL EDUCATED. A HIGH LITERACY RATE AND BETTER GROUNDING IN BASIC MATHEMATICS MAKE IT EASIER TO TEACH NEW TECHNIQUES TO JAPANESE WORKERS. FURTHER, THE SYSTEM OF LIFETIME EMPLOYMENT WHICH PREVAILS IN MOST MAJOR INDUSTRIES, WITH PAY PEGGED TO SUCH FACTORS AS LENGTH OF TIME EMPLOYED RATHER THAN TO THE JOB TO WHICH THE INDIVIDUAL IS ASSIGNED, MAKES THE JAPANESE WORKER MUCH LESS RESISTENT TO THE INTRODUCTION OF LABOR-SAVING MACHINERY AND REASSIGNMENT TO NEW TASKS THAN IS HIS U.S. COUNTERPART. MOREOVER, WITH LIFETIME EMPLOYMENT AND HEFTY BONUSES, PEGGED, IN PART TO HOW WELL HIS FIRM IS DOING, THE JAPANESE WORKER TENDS TO IDENTIFY WITH HIS COMPANY AND TO FEEL THAT WHAT IS GOOD FOR HIS COMPANY IS GOOD FOR HIM.

THE ECONOMIC HISTORY OF THE UNITED STATES IS UNIQUE. WE CANNOT EXPECT TO SOLVE OUR PRODUCTIVITY PROBLEMS BY INTRODUCING THE JAPANESE OR ANOTHER MODEL. WE MUST ACT IN A FASHION WHICH IS CONSISTENT WITH AMERICAN TRADITION AND EXPERIENCE. BUT WE MUST ACT PROMPTLY BOTH TO TAKE ADVANTAGE OF THE RECENT TAX LEGISLATION AND, AS INDIVIDUALS AND FIRMS, TO DEVELOP AN APPROACH WHICH PLACES A HIGHER PREMIUM ON PRODUCTIVITY INCREASES.

Representative RICHMOND. Thank you, Mr. Hormats.
Mr. Porter.

STATEMENT OF HON. ROGER B. PORTER, COUNSELOR TO THE SECRETARY OF THE TREASURY

Mr. PORTER. It is a pleasure to be here in my capacity as Counselor to the Secretary of the Treasury to share with you, Representative Richmond, and the other members of the subcommittee, some ideas and views about productivity and Japan. I have included a statistical analysis in my prepared statement that I am submitting for the record on the rates of productivity growth in the United States and Japan in the post-World War II period.

There are two things important to remember in reviewing these productivity trends. First, if one looks at cross sectors, one finds a wide differentiation and variety of experience in both the United States and Japan. For example, in Japan, some sectors, such as manufacturing, are very productive. Others, such as the Japanese distribution system, are relatively unproductive.

Second, all of the analyses and studies that economists have done on what accounts for productivity growth point not to a single cause, but rather to multiple causes for either successful or dismal productivity performance.

Perhaps the most important factor in accounting for the tremendous productivity in Japanese manufacturing is their high level of spending on plant equipment. The Japanese save approximately 32 percent of their GNP each year and have invested on average more than 25 percent of their gross national product in the private sector each year since 1965. Last year, in an economy that was less than two-fifths the size of the United States, Japan spent $330 billion on gross fixed capital formation, which was nearly three-quarters of the amount spent in the United States. Everywhere we visited in Japan, we saw new factories with new equipment. Clearly, the amount of capital workers have to work with has been an important contributing factor in their tremendous success in increasing rates of productivity growth in manufacturing.

Second, I would simply underline the points that Bob made about research and development and the role that the Japanese Government has played in facilitating technological innovation. For example, the Japanese Government sponsors research consortiums which are designed to lessen the dependence of Japanese firms on foreign innovations. These are typically organized by MITI—the Ministry for International Trade and Industry. These consortia bring together private and public sector scientists in common highly focused research efforts. Probably the most important consortium organized to date has been the VLSI, the very large-scale integration project which was undertaken between 1976 and 1980 to develop a new sophisticated computer circuitry.

According to Prof. Kent E. Calder, of Harvard University, this project operated on a budget of $360 million over the 4 years. Of this sum, $250 million came from the Japanese Government and the program, as a whole, was administered by a research association which was a special agency of MITI.

Interestingly, MITI purposely included rival private electronics manufacturers in its research groups, presumably so that fear of being preempted by rivals and of losing competitive position would induce firms to commercially exploit technical advances as quickly as possible. This strategy apparently has worked.

By July 1981, a little more than 1 year after the completion of the project, Mitsubishi Electric had introduced the 64–K random-access memory into mass production and many other major Japanese electronics firms are following closely on its heels.

Representative RICHMOND. Let me just interrupt for a second, Mr. Porter. You mentioned a consortium with a budget of $360 million and the Japanese Government did $250 million. By our American figures, I'm sure Mr. Cyert and Mr. LeVine would agree these are miniscule. IBM spends billions every year in its research and development. So do GE, Westinghouse, and many of our other high-technology companies. So it's really not the money.

Mr. PORTER. It's not so much the money. If you look at research and development spending in Japan and the United States, you will find that the Japanese spend about 1.8 percent of their GNP on research and development. We spend somewhere between 2 and 2.3 percent. In short, we spend a higher percentage of a larger gross national product on research and development.

Representative RICHMOND. But we do a lot of basic work.

Mr. PORTER. A higher percentage, between 40 and 50 percent, of U.S. research and development is Government funded. The thing you have to remember about our research and development is that a large percentage of it is defense- and aerospace-related. The Japanese Government spending proportion of R. & D. is 27 or 28 percent. They tend to be very selective and to concentrate on those areas where there are large risks or where they determine that some sort of cooperative mechanism is needed, such as in their aircraft and computer industries.

The third general observation that I would make is about robotics. I believe this is one of the important areas that will influence future rates of productivity growth. Over the past 5 years, in their assembly and processing industries, the Japanese have accelerated dramatically their use of robots. As best as I have been able to determine, Japan now boasts over half of the world's installed industrial robots, a technology, as Bob pointed out, which was first developed in Europe and the United States. MITI has played an important, but not a decisive role, in the development of Japan's robotics.

For example, MITI provided the money for establishing a robot-leasing company to support robot installation in small- and medium-scale manufacturers. They have arranged for direct Government low-interest loans for small and medium manufacturers. They have permitted special rapid depreciation for installing robots. an additional 12.5 percent in the first year. But I am convinced that Japan's success in installing and producing robots can be traced in large measure to their labor practices.

Most major Japanese corporations that have installed robots have a practice of lifetime employment and employee bonuses that are based in large part on the company's profitability. Both of these practices contribute to workers' welcoming, rather than opposing, the introduction of robots and, as Bob pointed out, they have been introduced grad-

ually, most frequently in jobs which are dirty, dangerous, repetitive, or unhealthy. Displaced workers are generally pleased at the prospect of being retrained for some other task or assignment within their company.

The fourth and final observation I would make concerns the much-discussed subject of Japanese management. Observing the management styles and techniques of several Japanese companies, as we did, leads one to the unsurprising conclusion that there is variety and diversity even within a relatively homogeneous culture. There is no single set of practices or management style used by successful Japanese enterprises any more than there is a single successful style in the United States. Having said that, it seems to me that there are certain factors or features of the environment in which private enterprise functions in Japan that are worth noting.

First, one is repeatedly impressed with the concentration on the long-term profitability of the enterprise. The notion of securing short-term gains at the possible expense of the long-term health of the company is an alien concept. I was impressed with the sense of what I like to call "determined patience," that given sufficient time and effort, persistence will bring the desired result.

A second overriding impression is that the major participants in the Japanese economy—management, labor and government—view one another as allies, not as adversaries. This is not to suggest that those in Japan in the public and private sectors don't have different perspectives and purposes and interests, because such is the case in virtually every free or mixed economy; but in our conversations with Japanese corporate leaders, one repeatedly came away with the feeling that private companies in Japan do not view the government as an adversary constantly interfering with their affairs. A pattern of cooperation, not confrontation, characterizes the relationship. The role of government is seen as assisting and encouraging private initiative, allowing private enterprise to function smoothly, and providing advice—what the Japanese sometime refer to as administrative guidance. Most frequently the administrative guidance is developed through consensus rather than issued as a directive. Rarely is it coercive. The emphasis tends to be on consensus building.

Third, one also gets the feeling in Japan that management cares about labor. There's a strong sense of identification with the company sustained by a sense of participation in the company's management. Through their lifetime employment and productivity-oriented bonus systems, there are also powerful incentives for employees to care about the company. It is no accident that in Japan company unions are the norm. All participants have the feeling that they have a stake in the company's success.

Finally, I came away with an intangible impression that is perhaps best described by the phrase, an approach to work. In many U.S. manufacturing establishments there is what might be called a job shop mentality, but in every plant that we visited in Japan there was what I would describe as a mass production mentality. This is not an attitude that includes sacrificing quality for quantity; quite the opposite. It is a mentality that goes hand in hand with an emphasis on quality. Indeed, in Japan we were repeatedly reminded that productivity and quality improvements are viewed as part of the same fabric.

I am convinced that while there are important cultural differences between the United States and Japan that limit the transferability of some practices and ways of operating, there are important lessons we can learn from Japan's consistent success in increasing her manufacturing productivity, not least the tremendous commitment that the Japanese have to savings as opposed to consumption, and to providing the capital and the wherewithal to allow their workers to realize these large productivity increases. Thank you.

[The prepared statement of Mr. Porter follows:]

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Prepared Statement of Hon. Roger B. Porter

Mr. Chairman and Members of the Committee:

I am pleased to have this opportunity in my capacity as Counselor to the Secretary of the Treasury to state my views on the subject of productivity and to share with you my impressions from a recent fact-finding productivity mission to Japan, an experience, I am happy to say, that I participated in with several of the distinguished members of this Committee.

America's "productivity problem" is a subject that has received a good deal of public attention during the course of the last decade, and especially in the last few years. Numerous books, articles, and monographs have been written on the subject. I understand that the Commerce Department maintains a clearing house on productivity literature that now boasts over 6,700 entries.

The conventional wisdom about America's productivity problem is that the United States has experienced a substantial

decline in the rate of productivity growth, and that many of our trading partners, most notably Japan and West Germany, have registered significantly higher growth rates in productivity--so much so, that Japan could replace the United States as the leading industrial power by the end of this century.

There is some truth in this view. The statistics point to a productivity slowdown. One way to grasp the dimensions of the productivity slowdown is by examining Gross Domestic Product (GDP) per employed person--a broad measure of labor productivity. Over the three decades from 1950 to 1980, real GDP per employed person increased at an annual rate of 1.7 percent per year in the United States. Since 1973, the average rate of gain in real GDP per employed person in the United States has been only 0.3 percent per year; in the period from 1965 to 1973 it was 1.7 percent per year; and in the period from 1950 to 1965 it was 2.4 percent per year.

Other industrial countries have also experienced productivity slowdowns since 1973. In some countries, the slowdown has been as sharp as in the United States. Canada shows a zero average rate of growth since 1973 in GDP per employed person--compared with about 2½ percent per year from 1950 to 1973; the United Kingdom, about 1 percent per year--compared with 2½ percent from 1950 to 1973; and Japan and the three largest continental European economies, 2 to 3 percent since 1973--compared with 8 percent in Japan from 1950 to

1973 and 4 to 6 percent in France, Germany, and Italy.

These statistics suggest that the slowdown in productivity growth is not simply an American problem. The other leading industrial nations of the world--our principal trading partners--have been similarly afflicted. Knowing this provides perspective on our problem, but it hardly offers us more than cold comfort. Among all of these nations, only Canada registered smaller annual average gains in GDP per employed person than the United States.

Of course, as with all statistics, productivity statistics must be used with care. GDP per employed person does provide a measure of economy-wide productivity, but it also has some shortcomings. For example, it includes public administration, and the United States and most other countries assume zero productivity growth for this sector because of measurement difficulties. Another failing of this particular productivity statistic is that it does not take into account changes in average hours worked; and it includes the effects of resource shifts among sectors with very different levels of productivity (all of these countries have undergone shifts in relative employment from agriculture to industry to services). For purposes of analyzing international competitiveness manufacturing productivity, as measured by output per hour, is a better indicator.

Productivity Trends--Manufacturing

Manufacturing productivity exhibits a similar pattern to GDP per employed person, with the U.S. showing the smallest average rate of gain since 1950. All of the major industrialized countries show a manufacturing productivity slowdown since 1973, although, for most countries, a less significant slowdown than in the GDP measure.

Since 1950 the U.S. rate of growth in manufacturing output per hour of 2.4 percent was only slightly lower than the United Kingdom's average rate of gain, but it was substantially below Japan's average annual gain of over 9 percent; France, Germany, and Italy's average gains of 5 to 6 percent; or Canada's 3.7 percent per year gain.

Since 1973 the U.S. rate of productivity increase in manufacturing has fallen to roughly half its post-1950 rate: 1.2 percent. With the exception of the United Kingdom, all of the foreign countries I have mentioned had larger 1973-80 manufacturing productivity gains than did the United States. Japanese performance in manufacturing was particularly impressive during this period and registered nearly a 7 percent annual rate of improvement.

Productivity Levels

While the United States has had the slowest rate of productivity growth, it still exceeds any other country in overall efficiency. Comparing productivity levels among

countries is much more difficult than comparing trends. However, information is available for comparing approximate levels of total GDP per employed person.

As of 1980, GDP per employed person in Canada, France, Germany, and the Benelux countries was around 90 percent of the U.S. level; in Japan, two-thirds of the U.S. level; and in Italy and the United Kingdom, 60 percent of the U.S. level. Because of the faster rates of productivity growth abroad, there has been a narrowing, in some cases a very substantial narrowing of the productivity gap. In 1950, the corresponding figures were: Canada, 85 percent of the United States; France, Germany and the Benelux countries, and the United Kingdom, about 35-55 percent; and Italy, 25 percent.

Most striking of all, of course, has been the closing of the gap by Japan. In 1950, Japanese GDP per employed person was only 15 percent of U.S. levels. And yet today analysts are contemplating a future in which Japan's productive capacity rivals or even exceeds that of the United States, itself. No longer is the prospect of "Japan as Number 1" the subject of only wild imaginings.

Explaining the Narrowing Productivity Gap

A fascination with the Japanese success story, like the equally compelling interest in America's relative decline, has generated a spate of reports, monographs, and studies which seek to uncover the anatomy of miracle growth rates.

In thinking about the contrasting performance of the U.S. and Japanese economies with regard to productivity growth rates, two important points should be kept in mind:

1. There are a large number of forces contributing to this productivity picture; there is no single cause that has enabled Japan to succeed, nor any single factor that has condemned America to a decade of slow growth.

2. It is important to disaggregate the overall productivity problem into its components. All sectors have not experienced red-hot growth in Japan, just as they have not all languished in the United States.

Explaining the Pattern of Productivity Growth in the U.S.

Students of America's productivity problem do not fully agree as to the causes of the slowdown, and there is even less agreement when attempts are made to quantify the causes. However, there is a general consensus among analysts that the single most important determinant of productivity per manhour is the quantity of capital--plant and equipment--per worker. Other things being equal, when the amount of capital grows more rapidly than the amount of labor, productivity per worker increases.

The evidence here is most revealing. During the 1964-68 period the ratio of the net stock of capital, excluding capital applied to pollution abatement, to manhours grew at

an average annual rate of 2.9 percent in the United States. From 1968 to 1973 the rate of growth in the capital/labor ratio declined to 1.8 percent per year, and from 1973-80, it fell to 0.7 percent per year. Thus, an important cause of the slowdown in the rate of increase in productivity per manhour in the United States has been a dramatic decline in the rate of growth of capital per worker.

The decline of growth in the capital/labor ratio can be traced, in turn, not only to the well publicized speed-up in the growth of the labor force, but also to a less well-known slowdown in the rate of capital formation. After growing at an average annual rate of 4.2 percent in the 1948-68 period, the growth rate of the net capital stock declined to only 3.0 percent in the 1973-79 period.

While the capital/labor ratio is certainly a very important determinant of productivity per worker, it is not the only determinant. Other factors affecting productivity are frequently cited, as well, although their measurement and contribution to productivity are far more difficult to define or quantify. These include changes in the composition of the labor force, sectoral shifts in human and capital resources, government regulations, advances in technological knowledge, and exogenous shocks, like the escalation of energy prices.

Composition of the Labor Force

The age-sex mix of the labor force began to change significantly in the mid-sixties when a large number of relatively unskilled and inexperienced young people and women entered the labor force for the first time. Youths between the ages of 16 and 24 comprised 21.5 percent of the labor force in 1970 and 23.5 percent in 1980. Similarly, the proportion of women in the labor force increased from 38.8 percent to 42.6 percent between 1970 and 1980. Since the official productivity figures are not adjusted for changes in the composition of the labor force, the significant influx of inexperienced workers into the labor force and especially into entry-level positions in low-productivity industries contributed to the measured productivity decline.

Sectoral Shifts

Shifts in capital and labor from agriculture to other sectors were an important contributor to productivity growth for the first two decades after World War II since the marginal productivity of labor and capital in nonfarm employment was much higher than the marginal productivity of these factors on the farm. The movement out of agriculture essentially ended at the beginning of the 1970s in the United States, however. The result was the termination of an important source of productivity growth.

Government Regulation

During the 1970s government-mandated regulations increased dramatically in the United States. These regulations impose a variety of costs which deter productivity growth. They require the allocation of current resources to meeting the regulations. They reduce the rate of return to capital formation. And finally, the uncertainty surrounding the regulations themselves and their implementation greatly hinders and inhibits investment.

I do not intend to suggest that these regulations have not had any beneficial effect. If the output sought by the regulations could be objectively evaluated (clean air, for example) some of the measured decline in productivity would be offset. Thus, in the often-cited example of the productivity decline in response to mandated regulations in mining, the actual result is not quite as severe as indicated if both measured and social outputs are considered. Nevertheless, as regards marketable output, productivity is down.

Advances in Technology

Advances in technological knowledge are also important determinants of productivity change. Measurement of the importance of the change is again frustrated, however, this time because of the lack of generally accepted measures of the stock of knowledge. Investigators of the subject have

attempted to measure it through expenditures on research and development employed in these activities and the issuance of patents. Such measures have serious deficiencies, but there appears to be a consensus that part of the slowdown in the growth of productivity is attributable to a decline in the rate of increase of our stock of knowledge.

Increases in the Price of Energy

The dramatic increase in the price of energy since 1973 has undoubtedly had a significant effect on productivity growth. The increase in energy prices has made a certain portion of the capital stock obsolete because of its dependence upon relatively high cost energy supplies. The result has been an adverse impact on the capital/labor ratio. Furthermore, to the extent capital inputs and energy inputs complement one another, the increase in energy prices tends to deter capital formation and results in a substitution of labor for capital which reduces measured labor productivity growth. While there is general agreement that rising energy prices contributed to the decline in productivity growth, there is little agreement regarding the magnitude of the effect. Still it is worth reiterating that all major industrialized countries experienced a significant decline in productivity growth after 1973, which suggests the impact of higher energy costs was important even if we are unable to measure the effect with precision.

The conclusion that I believe one should appropriately draw from a review of these arguments is that no single cause has crippled our productivity growth in the United States. Hence, if we are to succeed in rekindling rapid productivity growth in this country, we must attack the problem on a number of fronts.

Sectoral Variations in Productivity Growth Rates

Our understanding of productivity is also enhanced by examining the productivity problem sector by sector, and not simply focusing on the economy as a whole. If one disaggregates the problem, one discovers that there are significant differences across sectors in the U.S. economy. The same is true for Japan. For example, in the United States productivity growth in the mining and construction sectors has been extremely slow, especially since 1972, but the growth rate of productivity in the communications sector has been 6.8 percent per year during the same period.

Similarly, we should remember that the Japanese economy also exhibits wide variations across sectors. Japanese agriculture, for example, is riddled with inefficiences. The average size of the Japanese farm is 2.5 acres. While Japanese farmers are able to coax much out of the land through intensive farming practices, farm labor productivity in Japan is only a fraction of what it is on the much more efficient farms of America's heartland.

Japan's distribution system is also relatively unproductive. Japan has more shops and wholesalers per head of population than any other major industrial nation. There are, for example, almost as many retail outlets in Japan as in the United States, although Japan has only about half the population of America. Despite the explosion of supermarkets in the past decade, by 1979, sixty percent of Japanese retail outlets still employed no more than two people. Interestingly, Japan has more than twice as many retail outlets for food and clothing as does the United States and more retail outlets for electric appliances than we do. Much the same can be said of the Japanese wholesale distribution system. In 1976 Japanese goods went, on average, through the hands of four wholesalers, compared with 1.8 in America. Forty-five percent of these wholesale establishments employed four people or less.

It is, of course, in manufacturing that Japan's economy has made its most impressive productivity gains. According to official Japanese statistics, released through the Prime Minister's Statistics Office, productivity in the manufacturing sector climbed about 12 percent in 1979 and more than 9 percent last year. In machinery, the rate of productivity improvement has been particularly noteworthy: overall productivity grew at a 19.6 percent rate in 1980; productivity growth in

transport equipment was up 24.6 percent; and in precision instruments, the growth rate registered 35.6 percent. The result of this phenomenal surge in productivity — at a time when overall productivity in the U.S. was actually declining — showed up in unit labor costs. During 1979 and 1980 unit labor costs in Japan actually declined, while they increased by more than 11 percent in the United States.

The Productivity Mission to Japan: The Sources of Japan's Success

It was to take a first-hand look at the sources of this remarkable productivity record in manufacturing that I joined other members of the administration, members of Congress, and business and academic leaders in a recent productivity mission to Japan.

During the course of that mission, we met with government officials, academic experts, and business and labor leaders. We toured the facilities of Sony, Nissan Motors, Fujitsu Fanuc, Yamazaki, and Hitachi. We learned that there is no single source of Japan's success. Just as there are many, interrelated reasons why U.S. productivity growth has stagnated, there are numerous, interrelated reasons why Japan's productivity growth has surged.

Capital Investment

Perhaps the most important factor is the high level of spending on plant and equipment. The Japanese save approximately

32 percent of their Gross National Product each year. This exceptionally high savings rate has enabled them to invest on average more than 25 percent of their annual Gross National Product in the private sector since 1965. Last year, in an economy less than two-fifths the size of the United States, the Japanese spent $330 billion on gross fixed capital formation, nearly three-quarters of the total amount spent in the U.S. And, Japanese plant and equipment is of more recent vintage than plant and equipment in the U.S. In 1979, the average age of Japan's stock of capital was 8.2 years, compared with 10.2 years for the U.S. capital stock.

The Role of Government in Research and Development

Much has been written about the role of the Japanese government in assisting and coordinating Japan's industrial development. So taken were Western observers with the harmony and cooperation that seemed to characterize relations between business and government in Japan after World War II, that it became common to hear Japan's economic system referred to as if it were a giant corporation — Japan, Inc. Atop this colossus sat MITI — the Ministry of International Trade and Industry — which was supposed to have parceled out scarce resources to industries identified as "winners" and, at the same time, to have denied access to such resources by industries classified as "losers."

Like much conventional wisdom the concept of Japan Inc.

is a brew of uneven proportions. Amidst the reality implicit in the concept is a good deal of myth. I tend to share the view of Shohei Kurihara, the Vice Minister of MITI, that "MITI is like Mount Fuji. It looks good from far away, but it looks less good up close." I think the same thing can be said of Japan Inc.

This is not to deny that the Japanese government has played an active role in facilitating technological innovation. It has. For example, the Japanese government sponsors research consortiums designed to lessen the dependence of Japanese firms on foreign innovations. The Japanese system of permanent employment and Japan's traditional academic institutions which work so well for the country in other ways, are not well-suited to inventing and disseminating new ideas rapidly throughout the economy. In keeping research scientists tied to a single firm, permanent employment has tended to isolate Japanese scientists from each other, in contrast to the mobility with which researchers move from one firm to another in such places as California's Silicon Valley. Moreover, unlike such scientifically advanced universities as MIT and Caltech, Japanese universities have not served well as mechanisms for rapid diffusion of new technical ideas.

The government-sponsored research consortium was designed to overcome these obstacles. Typically organized by MITI, with access to subsidies contingent upon active participation,

these consortia bring together private and public sector scientists in common, highly focused research efforts. Probably the most important consortium organized to date has been the VLSI (Very Large Scale Integration) project which was undertaken between 1976 and 1980 to develop sophisticated new computer circuitry.

The goals of the consortium were to develop state-of-the-art electronic devices fitting hundreds of thousands of transistors onto a single four-inch silicon chip, with applications in pocket-sized computers, portable translation machines, voice recognition devices, and electronic mail transmission systems. The project proposed not only the development of a basic VLSI memory chip, but the development of sophisticated equipment for manufacturing VLSIs, as well.

According to Professor Kent E. Calder of Harvard University, the VLSI project operated on a budget of $360 million over four years. Of this sum, $250 million came from the Japanese government. The program as a whole was administered by the VLSI Technology Research Association, a special agency of MITI.

It is interesting to note that MITI purposely included rival private electronics manufacturers in its research groups, presumably so that fear of being preempted by rivals, and of losing competitive position, would induce firms to commercially exploit technical advances as quickly as possible. The strategy has apparently worked. By July, 1981, little more than a year after completion of the VLSI project, Mitsubishi Electric had introduced the 64-K random-access memory into mass production

with other major electronics firms following closely on its heels.

The government-sponsored research consortium that developed the VLSI is an example of the way in which government plays a major coordinating role in encouraging technological innovation in Japan. But although the government's share of financial support for the project was relatively large in this case, total spending by the Japanese government for research and development (R&D) is surprisingly modest. Only 27.7 percent of all Japanese R&D expenditures in 1979 were financed with public funds, as opposed to 49.3 percent in the United States. As Professor Calder has concluded: "Such figures are...indicative of the relatively indirect, non-intrusive character of Japanese science and technology policy — a trait also prominent in other policy spheres as well."

The role of the Japanese government and MITI in research and development is selective rather than comprehensive. It concentrates in those areas where there are large risks or where a cooperative mechanism is needed — the sunshine energy project, and the aircraft and computer industries, for example.

Automation and Robotics

A third area contributing to Japanese manufacturing productivity is automation and robotics. Over the past five years, automation in assembly and processing industries, from automobiles to machine tools and copying equipment, has accelerated

dramatically. Nowhere is this development as well understood as in Japan where high capital investment, long-term strategic planning, lifetime employment, and advanced process-technology innovation combine to help Japan exploit the opportunities which automation presents for improving productivity.

According to one 1980 report, Japan now boasts over one half of the world's installed industrial robots, a technology first developed by European and American companies. Today, Japan has no fewer than 135 manufacturers of robots producing annually more robots than the total now installed in the United States.

Robots are forming the cornerstone of flexible manufacturing systems, combinations of robots and computer-controlled machine tools which bring the benefits of automation to the production of small batches of parts. The key is the robot's ability to switch from one task to another. By varying the sequence in which parts are transferred between different machine tools, the robot gives such systems the flexibility to handle a variety of parts. Thus, one need not produce any single part in large quantities to justify the costs of automation.

The potential for expanding the use of robots is immense. Today the automobile industry employs some 60 percent of the world's robots. And General Motors has plans to spend over $1 billion by 1990 to purchase and install more than 14,000 new robots — three to four times the number of robots in all U.S.

industry today. But it is not just in automobile production that robots can make a major contribution. According to a study at Carnegie Mellon University, 4-7 percent of U.S. factory jobs could be filled by robots.

MITI has played an important but not decisive role in the development of Japan's robotics industry. MITI provided for the establishment of a robot leasing company to support robot installation by small and medium-scale manufacturers, arranged for direct government low-interest loans, and has permitted special rapid depreciation for installing robots.

Japan's success in robot production and installation can be traced, in large measure, to its labor practices. Most major Japanese corporations have a practice of lifetime employment and employee bonuses based in large part on the company's profitability. Both of these practices contribute to workers welcoming rather than opposing the introduction of robots. Not least, robots are most frequently used in dirty, dangerous, repetitive, and unhealthy jobs. Displaced employees are generally pleased at the prospect of being retrained for some other task or assignment within the company.

The Constellation of Japanese Management, Labor, and Government

Observing the management styles and techniques of several Japanese companies leads one to the unsurprising conclusion that there is variety and diversity even within a relatively homogeneous culture. There is no single style or set of practices followed

by successful Japanese enterprises anymore than there is in the United States. Having acknowledged that a healthy measure of variation exists, there are certain features of the environment in which private enterprise functions in Japan that are worth noting.

First, one is repeatedly impressed with the concentration on the long-term profitability of the enterprise. The notion of securing short-term gains at the possible expense of the long-term health of the company is an alien concept. One is impressed with a sense of determined patience — that sufficient time and effort will bring the desired result.

A second overriding impression is that the major participants in the Japanese economy — management, labor, and the government — view one another as allies, not adversaries. This is not to suggest that in Japan those in the public and private sectors do not have different perspectives, and purposes, and interests. Such is the case in virtually every free or mixed economy. But in our conversations with Japanese corporate leaders, one repeatedly came away with the feeling that private companies in Japan do not view the government as an adversary constantly interfering with their affairs. A pattern of cooperation not confrontation characterizes the relationship.

The role of government is seen as assisting and encouraging private initiative, of allowing private enterprise to function smoothly, of providing advice, what the Japanese sometimes refer to as administrative guidance. Most frequently the administrative guidance is developed through consensus rather than issued

as a directive. Rarely is it coercive; the emphasis is on consensus building.

Third, one also gets the feeling in Japan that management cares about labor. There is a strong sense of identification with the company sustained by a sense of participation in the company's management frequently through the use of quality circles. And through their lifetime employment and productivity oriented bonus systems there are also powerful incentives for employees to care about the company. It is no accident that in Japan company unions are the norm. All participants have the feeling that they have a stake in the company's success.

Finally, I came away with an intangible impression that is perhaps best described by the phrase an approach to work. In many U.S. manufacturing establishments there is what might be called a job shop mentality. But in every plant we visited in Japan there was what I would describe as a mass production mentality. Importantly, this was not an attitude that included sacrificing quality for quantity; quite the opposite. It was a mentality that went hand in hand with an emphasis on quality. Indeed, productivity and quality were seen as part of the same fabric.

While there are important cultural differences between the United States and Japan that limit the transferability of some practices and ways of operating, there are important lessons we can learn from Japan's success in consistently increasing her manufacturing productivity as America responds to the productivity challenge of the 1980's.

Representative RICHMOND. Thank you, Mr. Porter.

Representative Rousselot.

Representative ROUSSELOT. I am delighted to be here. I have a very brief opening statement that I have submitted for the record. I don't want to read it.

I'll just say basically that I think it's difficult to change direction overnight when we have had policies from Government that in many cases have discouraged productivity. So we are in hopes, as you know, of changing that direction and I think that's the main point that I make in my opening statement.

Do you want me to start or are you going to start?

Representative RICHMOND. We have two more witnesses.

Representative ROUSSELOT. OK.

Representative RICHMOND. Mr. Cyert, it's an honor and pleasure to have you.

STATEMENT OF RICHARD M. CYERT, PRESIDENT, CARNEGIE-MELLON UNIVERSITY

Mr. CYERT. I have given you a prepared statement and I'll try to summarize it.

Representative RICHMOND. Your entire statement will be included in the record.

Mr. CYERT. I will try to summarize the main points.

I think one of the factors that should be taken into account in understanding Japan and the Japanese development is the fact that the Japanese had 3 years of rapid population growth, as opposed to 16 years in the United States. Abortion was introduced in Japan after 3 years and in the United States this continued for a longer period of time.

Now what this meant and what this means is that the Japanese have suffered a labor shortage much sooner than in the United States. That's point one.

Point 2 is that the Japanese are a very homogeneous population. Almost everyone in the society has at least a high school degree. So what was developing in Japan in the early seventies was a situation in which there was a rapid turnover in their industry because these more educated people were having difficulties in staying on routine jobs on the assembly line and it was very difficult when they left for the firms to find other people. So the combination of the labor shortage and the high level of education drove the Japanese into looking for other ways of handling their problem. It was this factor which led the Japanese into adopting the concepts of participatory management which had been discussed by psychologists in this country for many years and had been more or less ignored by American industry—not completely, but certainly not been jumped on. The Japanese have followed the writings here of academics I would say much more closely than American industry does—it's the old story of an expert is someone who's 100 miles away from home with a briefcase. So the Japanese are viewed much more as experts than this country.

In any event, Japan moved to this sort of participatory management and that's when the development of the quality circles and other factors came about. They found by giving more inputs to these peo-

ple they were able to keep them longer or reduce the turnover, and there was a great groundswell among industry to adopt these same characteristics.

It was also this labor shortage that drove the Japanese to look toward robotics. In other words, the use of robots was crucial to them because of a shortage of labor. So we should not look back and say how did these people find these great ideas and how far superior they are to those of us in the United States to move in this direction. They were driven to a great extent by the demographics. I don't want to take any credit away from them because I think the Japanese are bright and hard working. We can learn a great deal from that aspect, but there is nothing in general in the tide of human affairs in any country which suddenly results from a miracle. The Japanese are human beings just as we are and are driven by forces within their society. I believe the whole drive from the demographic change has been a big factor in what they have done. It isn't that they were necessarily more farsighted than we are.

There are lots of good factors that we ought to be looking at in the Japanese society, and many of which have already been discussed in Representative Richmond's opening statement and by the other two witnesses. My only word of counsel is that I don't think we should overemphasize any of these factors. They are important, but I don't think they are overwhelming and there are going to be certain aspects that we aren't able to adopt.

As an illustration, we have become much more, let's say, enthralled or stimulated by the fact that the Japanese have lifetime employment, an interesting concept. Those of us who run universities have had the concept of lifetime employment for a long time, namely, tenure. We are quite familiar with it and we don't advocate it. It has some virtues in the academic scene. It also has a lot of negatives. Nobody wants to destroy tenure, but there are pluses and minuses and I don't think that one should look upon lifetime employment as necessarily the variable which we should embrace in industry and which will be the solution to many problems. I think the whole concept with which we have managed in universities, getting more input, for example, from faculty not necessarily treating faculty as employees, are factors from which industry should and can learn. I intend to do some writing in this area to try to point out the similarities with Japanese system and what can be learned.

My main theme is that the crucial element for the Japanese for the future is their increased use of robots. I believe that the future of American industry is going to be closely tied to our ability to move in the area of robotics.

Now there is no question that the Japanese have the first generation of robots tied up. Most of the robots that you will see over the next 6 or 7 years are going to be Japanese. Many of these have been adapted from American robots and they will be mixed with American robots as the Japanese sell systems. But the real battle and the real future lies in the development of robots that can see and think and have better capacities for sensing. It is here that I think we must be doing the bulk of the work.

Now, interestingly enough, the Japanese are also seeing this. They have started a research project on the order of those that Mr. Porter

has described to try to help Japanese industry to catch up in the field of artificial intelligence. Artificial intelligence is basically the field which has studied human thinking, human thought processes, and has attempted to develop computer programs that will think like human beings.

This work, a great deal of which has been done at Carnegie-Mellon University, as well as MIT and Stanford University—these three schools happen to be three major schools in the country in terms of computer science, and I might just add, as an aside, they are that way because they were in the field early with good people and because of the support that has come from the Department of Defense, specifically the Advanced Research Projects Agency.

ARPA, now called DARPA, has invested money in quantities that the National Science Foundation could not do in these three schools. It is acknowledged by everyone in the field that these three are far ahead of the rest of the group.

There is actually some attempt to think of financing arrangements that would develop more first class computer science departments.

In any event, Carnegie-Mellon has moved into the area of robotics. We have the people. It requires strength in computer science, strength in electrical engineering, and to a lesser degree strength in the business school. We have that and the other two schools also have it. We have the ability, perhaps because we're smaller, of being able to move faster and with more resources. We have now the Robotics Institute that is dedicated to the development of robots that are going to be able to see and think, and at the same time we are working on improving the sensing capacity.

These robots are going to be the kind of robots on which we have to depend in the future for increases in productivity. It basically comes back to a point Mr. Porter made—we must increase the amount of capital that we have in relationship to labor.

I think that the kind of things that are happening in our labor force you should also be aware of. From 1969 to 1979, our labor force increased at an interest rate of 3.5 percent. In the eighties, the forecast is that the labor force will grow at a 1.1-percent rate, less than half of the rate it grew at from 1969 to 1979.

Now this means that with even modest growths in GNP that we are going to increase employment for the incoming additions to the labor force. So, in contrast to the seventies when the economy was generating new jobs at record rates and unemployment was increasing, we find that in the eighties, even modest increases in the number of new jobs are going to wipe out the increments to the labor force and we—unless there's some other changes in immigration policy or something of that kind—will be facing labor shortages. I think they are already turning up in a number of places, but certainly I would say from 1985 on we are going to be seeing these shortages.

As you probably know, the number of high school graduates peaked in 1978 and is already decreasing. So high school graduates are already getting offers for higher salaries and, of course, at the bachelor's level these are great and are going to become greater as the number of college graduates increases.

We have to have increases in robots in order really to compensate for the decreases that we are going to be suffering in the labor force. It's

not a matter of taking jobs away from people. There undoubtedly will be some of that in the very short run, but we have to be looking to what we are going to have to have in order to maintain ourselves as a first-rate economic power. We are going to have to have something to replace the shortage of labor, and I will add an additional point, to supplement the older labor force that we will be having. Even though there still are a large number of people retiring early, many of these are also getting second jobs or getting other jobs after they retire, and we are going to have on average an older labor force.

Robots will be capable then of supplementing jobs requiring physical strength. Robots will be able to replace many jobs that are both dirty and dangerous.

Now just as an example, our Robotics Institute has two major partners in it. One is the Westinghouse Electric Corp. which has had a strong interest in this whole area. The second partner is the U.S. Government through the Office of Naval Research. Tom Murrin from Westinghouse and Admiral Baciocco, who formerly headed the Office of Naval Research and is now out at sea, have seen the potentials in this area.

We have other corporations in with us, but the two major partners at the moment are the Office of Naval Research where we are trying to develop underwater robots that will be able to handle some tasks for the Navy and the Westinghouse Electric Corp.

The payoff in this area is so great that we believe that the initial funding of Westinghouse may within a year pay back three times. I think they put in approximately $1.5 million. We treat this project as a joint venture. This is a concept that I believe is necessary for universities to understand, and their activities should be viewed as joint ventures with industry or with government. We meet quarterly to go over our projects, just as businesses might meet, and we are trying to estimate savings and gains from these projects and they look good.

Now again, when we talk about robots, we should also view more widely the whole field of the use of computers. I think that the question that we have to be thinking about is how do we develop the factory of the future and where the future is not going to be far in advance. That's the concept that we're looking at.

Now for just a simple example of the way in which computers can be used effectively in industry in ways that they have been ignored, we have for many years trained pilots through simulators. However, we discovered with one of the companies with which we are working that they had an assembly line where they had a lot of turnover. They had to put workers in that assembly line and these workers had to use a great deal of judgment in terms of the particular product that's being made.

Well, we were able to simulate this whole production process just as you can simulate flight. The workers are now being trained on the simulator so that when they go to the assembly line they are experienced, and the amount of savings in this particular process just through defective products is going to be significant. I think the estimate was something in the way of $250,000 in 1 year. Now here's a simple device that we can do that can be used in a wide range of areas. Again, I think probably those organizations such as David LeVine's,

who have been involved in the work in the Department of Defense, do this for defense-related industries and defense-related products.

One of the routes that we should be taking for the future is to find ways of increasing this university-industry relationship and to try, in particular, to stimulate increased growth in the robotics-type research. However, I think it should be done jointly.

One of the problems we have in the United States relates to one of the earlier questions of Mr. Long about how do we get things into practice—there have been many studies that put the time period between 14 and 18 years from an idea in the laboratory to getting that product in the market. We are hoping that by a close relationship with industry we are going to be able to move more rapidly from the laboratory to the product. We are hopeful that as we develop new ideas for robots that those will be picked up and can be manufactured and put into the market in a much faster way. At the moment I believe that the great future for the United States lies in robots of this kind and that this is the way in which we have to move.

I'd just make one other minor point on this. I think a lot of this activity is going to come voluntarily; however, the last tax bill had a kind of negative effect on it that bothers me somewhat. There was a good point in the sense that industry was able to get an extra 25-percent reduction in taxes for research expenditures in excess of the previous year; however, for anything that went with universities, they will only get, I believe, 65 percent of that 25 percent. So there's a greater incentive under the new tax bill for industry to do it in its own laboratory rather than in cooperation with universities. I don't think this is going to affect our particular relationship, but I think it's an element that is a move in the wrong direction. I believe the relationship between industry and universities is one of the strengths we have and in particular the Japanese do not have, and that, in the long run, we can build on that in a good way. Thank you.

[The prepared statement of Mr. Cyert follows:]

Prepared Statement of Richard M. Cyert

Various students of the Japanese economy have highlighted the variables that have accounted for its extraordinary progress. The growth in productivity has been spectacular even though the economy of Japan is still behind ours in overall production.

To some, the relationship between government and business is the key. The fact that the Japanese government can organize a consortium of firms to concentrate on particular problems without violating anti-trust laws and the fact that the government can contribute money to the work of the consortium seem to be the key to improving productivity. Thus, many businessmen seeing this aspect have called for a wholesale revision of the anti-trust laws in the U.S. and have been seeking ways that American firms can cooperate more effectively in order to participate more fully in foreign trade.

To some others, the key is the financing arrangements of the Japanese firms and the role of the banks in relationship to those firms. In most industries, the firms are financed primarily by debt and have only a small amount of equity. The debt is generally owned by a bank that, in turn, has a strong relationship with the firm. Thus, the firm has less concern than would its American counterpart about the interest charges on the debt and has less pressure to pay dividends because of the relatively small number

OF STOCKHOLDERS. THE RESULT IS THAT THE JAPANESE FIRM CAN TAKE A LONGER-RUN VIEW OF THE ECONOMY IN CONTRAST TO THE AMERICAN FIRM THAT HAS TO WORRY ABOUT IMMEDIATE RESULTS IN ORDER TO PLEASE STOCKHOLDERS AND THE STOCK MARKET.

TO OTHERS, THE PARTICIPATORY MANAGEMENT OF JAPANESE FIRMS IS ANOTHER VARIABLE. THE JAPANESE, FOR A VARIETY OF REASONS, HAVE ADOPTED SOME OF THE SUGGESTIONS DEVELOPED IN DETAIL BY VARIOUS AMERICAN INDUSTRIAL PSYCHOLOGISTS. THESE PSYCHOLOGISTS HAVE ARGUED THAT PRODUCTIVITY CAN BE IMPROVED BY ALLOWING EMPLOYEES TO HAVE A BIGGER INPUT IN THE DECISION-MAKING PROCESS OF A FIRM. THESE WRITINGS HAVE EXISTED FOR MANY YEARS, BUT RELATIVELY FEW AMERICAN FIRMS HAVE UTILIZED THEM. THE JAPANESE, BECAUSE OF A RAPID TURNOVER OF EMPLOYEES IN THE 1973-74 PERIOD, BEGAN TO ADOPT THESE METHODS AS A WAY OF REDUCING TURNOVER. IN ADDITION, THE JAPANESE HAVE THE CONCEPT OF LIFETIME EMPLOYMENT, WHICH IS SIMILAR TO TENURE IN A UNIVERSITY. MANY BUSINESSMEN IN THE UNITED STATES HAVE DIFFICULTY IN UNDERSTANDING TENURE. THE JAPANESE SEEM TO HAVE TURNED THE CONCEPT OF LIFETIME EMPLOYMENT, IN THE EYES OF SOME, INTO A POSITIVE ELEMENT THAT IMPROVES PRODUCTIVITY. ALONG WITH PARTICIPATORY MANAGEMENT HAS GONE A STRONG ABILITY OF JAPANESE WORKERS TO MANUFACTURE PRODUCTS OF HIGH QUALITY THE FIRST TIME THROUGH THE PRODUCTION LINE. AMERICAN FIRMS CAN MATCH OR BEAT THE QUALITY OF JAPANESE FIRMS FOR ANY PRODUCT, BUT THE AMERICANS GENERALLY HAVE TO DO IT BY REWORKING THE PRODUCT SEVERAL TIMES, WHICH BECOMES EXPENSIVE.

PERHAPS THE MOST IMPORTANT REASON FOR THE INCREASES IN PRODUCTIVITY, AND FOR THE EXPECTED INCREASES IN PRODUCTIVITY, IS THE EXTENSIVE AND PROSPECTIVE USE OF ROBOTS. JAPAN, THROUGH ITS GOVERNMENT AND INDUSTRY, HAS HAD THE FORESIGHT TO INVEST IN ROBOTRY. IN PART, THE COUNTRY WAS FORCED TO MOVE IN THIS DIRECTION BECAUSE OF THE LABOR SHORTAGES STEMMING FROM THE REDUCTION IN THE BIRTH RATE. JAPAN HAD THREE YEARS OF A RAPID BIRTH RATE BEFORE ABORTION BECAME LEGAL IN CONTRAST TO OUR SIXTEEN YEARS OF RAPID GROWTH. THE JAPANESE ARE THUS SUFFERING FROM A LABOR SHORTAGE THAT WE WILL BE EXPERIENCING LATER ON IN THIS DECADE. I WILL SAY MORE ABOUT THAT SUBJECT LATER.

THE JAPANESE, THROUGH THEIR GOVERNMENT AND LABOR CONSORTIA, HAVE BEEN SPENDING BETWEEN $200 AND $300 MILLION A YEAR ON RESEARCH IN ROBOTS. IN THE UNITED STATES, THERE IS NO SUCH CONCENTRATION OF RESEARCH. IN TERMS OF PUBLIC CENTERS, I BELIEVE CARNEGIE-MELLON'S IS THE LARGEST WITH A BUDGET OF $4 MILLION. THERE MAY WELL BE INDUSTRIAL FIRMS THAT ARE SPENDING MORE ON THIS PARTICULAR AREA, BUT I AM REFERRING ONLY TO RESEARCH INSTITUTES ABOUT WHICH I HAVE SOME KNOWLEDGE. THE JAPANESE ARE NOT AHEAD OF US EITHER TECHNOLOGICALLY OR SCIENTIFICALLY. THERE IS NO SECRET KNOWLEDGE THAT THEY HAVE UTILIZED IN ORDER TO DEVELOP ROBOTS. THE SAD ASPECT IS THAT THE KNOWLEDGE AND, IN MANY CASES, THE ROBOTS THEMSELVES ARE AMERICAN. THEY HAVE

BEEN ADAPTED IN SO MANY WAYS BY THE JAPANESE, BUT MORE IMPORTANTLY THEY HAVE BEEN ADOPTED BY JAPANESE FIRMS. JUST AS IN THE CASE OF PARTICIPATORY MANAGEMENT, THE JAPANESE INDUSTRIAL LEADERS HAVE LISTENED TO THE SPEAKING AND WRITING OF MANY AMERICAN SCHOLARS AND SCIENTISTS AND HAVE BEEN FORESIGHTED ENOUGH TO MOVE INTO THIS AREA.

HOWEVER, THESE JAPANESE ROBOTS ARE BASICALLY SIMPLE AND CANNOT SEE NOR THINK. HOWEVER, FOR THE UNITED STATES, IT IS THE SECOND GENERATION OF ROBOTS THAT IS CRITICAL FOR OUR FUTURE. THE ROBOTICS INSTITUTE OF CARNEGIE-MELLON UNIVERSITY IS DEVELOPING THAT GENERATION OF ROBOTS. THERE ARE ONLY THREE ACADEMIC INSTITUTIONS WITH MAJOR COMPUTER SCIENCE PROGRAMS WHERE A ROBOTICS INSTITUTE CAN DEVELOP THIS TYPE OF ROBOT: THOSE INSTITUTIONS ARE CARNEGIE-MELLON, STANFORD, AND MIT. CARNEGIE-MELLON, FOR A VARIETY OF REASONS, IS THE ONLY ONE OF THE THREE THAT HAS BEEN ABLE TO DEVELOP A CONCENTRATED EFFORT IN THE AREA. OUTSTANDING DEPARTMENTS OF COMPUTER SCIENCE, ELECTRICAL ENGINEERING, AND MECHANICAL ENGINEERING, AND TO A LESSER EXTENT, A BUSINESS SCHOOL, ARE NECESSARY FOR THE DEVELOPMENT AND EXPLOITATION OF ROBOTS.

ONE OF THE MOST CRITICAL ELEMENTS IN ROBOTRY IS THE NEED TO DEVELOP THE CAPACITY TO THINK. IN THE ROBOTS OF THE FUTURE, THIS CAPACITY WILL EVOLVE FROM THE WORK THAT

HAS BEEN DONE IN THE FIELD OF ARTIFICIAL INTELLIGENCE, WHICH HAS ATTEMPTED TO PROGRAM COMPUTERS SO THAT THEY ARE CAPABLE OF THINKING LIKE HUMAN BEINGS. AGAIN, THIS WORK HAS DEVELOPED AT THE THREE LEADING SCHOOLS THAT I HAVE MENTIONED.

THE ROBOTICS INSTITUTE OF CARNEGIE-MELLON UNIVERSITY IS A MODEL OF THE WAY IN WHICH GOVERNMENT, INDUSTRY, AND UNIVERSITIES CAN BECOME PARTNERS IN A PROJECT THAT IS VITAL FOR THE LONG-RUN ECONOMIC HEALTH OF THE COUNTRY. THE TWO MAJOR PARTNERS WITH CARNEGIE-MELLON ARE THE WESTINGHOUSE ELECTRIC CORPORATION AND THE U.S. NAVY THROUGH ITS OFFICE OF NAVAL RESEARCH. THOMAS MURRIN, PRESIDENT OF THE PUBLIC SYSTEMS CORPORATION OF WESTINGHOUSE, AND ADMIRAL ALBERT BACIOCCO WHO UNTIL RECENTLY HEADED THE OFFICE OF NAVAL RESEARCH, ARE THE TWO INDIVIDUALS WHO WERE FORESIGHTED ENOUGH TO MOVE INTO THE AREA AND TO GIVE GREAT ENCOURAGEMENT TO THIS AREA. ADMIRAL BACIOCCO, FOR EXAMPLE, TWO YEARS AGO LAUNCHED A SERIES OF LECTURES AT THE PENTAGON ON ARTIFICIAL INTELLIGENCE BECAUSE HE SAW THE IMPORTANCE OF THIS FIELD FOR THE MILITARY.

IT IS CRITICAL IN AN EFFORT OF THIS KIND TO HAVE MAJOR INDUSTRIAL PARTNERS. STUDIES BY THE NATIONAL SCIENCE FOUNDATION HAVE SHOWN THAT IT TAKES BETWEEN FOURTEEN AND EIGHTEEN YEARS FOR AN IDEA TO GO FROM THE LABORATORY

TO A COMMERCIAL MARKET. AMERICA CANNOT AFFORD TO WAIT THAT LONG. IF WE ARE TO REMAIN THE LEADING INDUSTRIAL POWER IN THE WORLD, WE MUST BE ABLE TO UTILIZE QUICKLY A NEW GENERATION OF ROBOTS WHEN IT APPEARS, AND WE MUST HAVE THEM ON THE MARKET AS RAPIDLY AS POSSIBLE. BECAUSE THE JAPANESE DEVELOPED THE FIRST GENERATION OF ROBOTS, THEY WILL HAVE A MAJOR FOOTHOLD IN THIS INDUSTRY. HOWEVER, IF THE VENTURE AT CARNEGIE-MELLON WITH ITS PARTNERS CAN BE SUCCESSFUL, AMERICA CAN BE IN A POSITION TO MAKE THE SECOND GENERATION OF ROBOTS AMERICAN.

FOR SEVERAL REASONS, THE DEVELOPMENT OF ROBOTS THAT CAN SEE AND THINK IS CRITICAL TO THE FUTURE PRODUCTIVITY OF THIS COUNTRY. THE FIRST REASON IS WAGE RATES. IN SEVERAL OF OUR INDUSTRIES THAT ARE CRITICAL TO THE ECONOMY, INCREASES IN WAGE RATES HAVE EXCEEDED INCREASES IN PRODUCTIVITY. SUCH A PHENOMENON CAN CONTINUE WITHOUT AN INDUSTRY'S BEING ADVERSELY AFFECTED SO LONG AS NO INTERNATIONAL COMPETITION EXISTS. HOWEVER, IN BOTH THE STEEL AND AUTOMOBILE INDUSTRIES, THE JAPANESE ARE ABLE TO OPERATE WITH LOWER WAGE RATES AND HIGHER PRODUCTIVITY. THUS, THESE AMERICAN INDUSTRIES MUST COMPETE AT A SIGNIFICAN DISADVANTAGE. AT THE SAME TIME, IT MUST BE REALIZED THAT THERE IS NO WAY THAT WAGE RATES ARE GOING TO BE REDUCED. OUR MAJOR HOPE IS TO INCREASE PRODUCTIVITY TO

THE POINT THAT THE HIGHER WAGE RATES CAN BE JUSTIFIED BY THE PRODUCTIVITY. IT IS UNLIKELY THAT WE CAN GET ENOUGH INCREASE IN PRODUCTIVITY OUT OF CONVENTIONAL METHODS. I DO NOT BELIEVE AMERICAN WORKERS ARE LAZY OR ARE NOT WORKING HARD ENOUGH. WE HAVE PROBLEMS IN SOME AREAS WITH ABSENTEEISM AND OTHER ELEMENTS THAT MAY REDUCE PRODUCTIVITY, BUT THE SOLUTION TO THOSE PROBLEMS WILL NOT BY ITSELF BRING PRODUCTIVITY TO A HIGH ENOUGH LEVEL.

IT IS MY FIRM BELIEF THAT THE MAJOR HOPE FOR THE INCREASE IN PRODUCTIVITY MUST COME FROM THE INTRODUCTION OF A GREATER NUMBER OF MAN-MACHINE SYSTEMS. IN OTHER WORDS, I AM SPEAKING OF THE USE OF ROBOTS IN RELATIONSHIP TO LABOR. WITH ROBOTS, WE CAN GIVE MORE CAPITAL PER WORKER, AND THE INTERACTION CAN RESULT IN SIGNIFICANT PRODUCTIVITY INCREASES. IN ADDITION, I BELIEVE THAT THE INTRODUCTION OF SUCH SYSTEMS WILL ALSO IMPROVE SUBSTANTIALLY THE QUALITY OF THE PRODUCT.

I MIGHT GIVE ONE ILLUSTRATION OF THE WAY IN WHICH THE USE OF A COMPUTER CAN IMPROVE PRODUCTIVITY AND QUALITY. ONE OF THE FIRMS WITH WHOM WE ARE ASSOCIATED IN OUR ROBOTICS INSTITUTE HAS AN ASSEMBLY LINE IN WHICH A GREAT DEAL OF JUDGMENT MUST BE USED BY THE WORKERS IN THE PRODUCTION PROCESS. THERE IS A LARGE TURNOVER AMONG THE WORKERS; AND, AS A RESULT, ON-THE-JOB TRAINING MUST BE USED WITH A TREMENDOUS AMOUNT OF DEFECTIVE PRODUCT THAT MUST BE

REJECTED. THE SCIENTISTS IN OUR ROBOTICS INSTITUTE LOOKED AT THE PRODUCTION PROCESS AND DEVELOPED A COMPUTER SIMULATION OF IT. THIS TRAINING DEVICE IS NOT UNLIKE THE SIMULATORS THAT ARE USED TO TRAIN AIRPLANE PILOTS. BECAUSE THIS SIMULATION IS BEING UTILIZED TO TRAIN THE WORKERS, THE ERRORS THAT FOLLOW FROM A NEW WORKER ON THE PRODUCTION LINE ARE BEING ELIMINATED. THUS, WITH THIS TRAINING DEVICE, THE FIRM CAN EFFECTIVELY HAVE EXPERIENCED WORKERS ON THE LINE AT ALL TIMES. THIS ILLUSTRATION PROVES THAT GREATER USE MUST BE MADE IN AMERICAN INDUSTRY OF THE SCIENTIFIC TECHNIQUES THAT WE HAVE DEVELOPED.

ONE OF THE VITAL REASONS FOR OUR NEED TO DEVELOP ROBOTS IS THE DEMOGRAPHICS RELATING TO OUR LABOR FORCE. FROM 1969 TO 1979, THE LABOR FORCE GREW AT A 3.5% ANNUAL RATE, OR AT A COMPOUND INTEREST RATE OF 3.5%. FOR THE 1980'S, THE EXPECTATION IS THAT THE LABOR FORCE WILL GROW AT A RATE OF 1.1%. BECAUSE OF THE REDUCTION IN THE NUMBER OF WORKING WOMEN, WE CAN EXPECT A MUCH LOWER RATE OF GROWTH IN OUR LABOR FORCE. A 1.1% GROWTH IS LOW ENOUGH SO THAT EVEN MODEST GROWTHS IN THE LABOR FORCE ARE GOING TO PRODUCE SIGNIFICANT LABOR SHORTAGES DURING THE 80'S, WITH THE MOST SEVERE IN THE LATTER PART OF THE DECADE. IN ADDITION, OUR LABOR FORCE WILL BE OLDER. THUS, WE ARE LOOKING TOWARD A NEED FOR INCREASED LABOR. THE 80'S SHOULD BE A PERIOD IN WHICH UNEMPLOYMENT IS A MUCH LESS SEVERE PROBLEM THAN IT HAS EVER BEEN IN OUR HISTORY. RATHER, OUR PROBLEM WILL BE FINDING ENOUGH WORKERS.

IN THIS BRIEF DOCUMENT, I HAVE TRIED TO SUMMARIZE A FEW OF THE IDEAS THAT RESULTED FROM MY VISIT TO JAPAN.

MY MAJOR HOPE FOR THE UNITED STATES IN TERMS OF PRODUCTIVITY RIDES WITH THE DEVELOPMENT OF SOPHISTICATED ROBOTS, BASED ON COMPUTER SCIENCE AND ENGINEERING. THIS DEVELOPMENT SHOULD NOT BE CONTESTED BY LABOR UNIONS. THE ROBOTS IN THE LONG-RUN WILL NOT ELIMINATE JOBS. THEY WILL MAKE PRODUCTIVITY HIGHER FOR LABOR AND WILL MAKE IT POSSIBLE TO DEVELOP HIGHER WAGE RATES. IN ADDITION, ROBOTS WILL ALLOW OLDER WORKERS TO WORK MORE PRODUCTIVELY FOR LONGER PERIODS OF TIME SINCE THE ROBOTS CAN DO THE HEAVIER WORK. IN TERMS OF ACTIONS BY CONGRESS, I BELIEVE THAT THE MOST EFFECTIVE ACTION THAT CONGRESS CAN TAKE IS TO ENCOURAGE COOPERATION BETWEEN UNIVERSITIES AND INDUSTRIES BY STIMULATING THE TAX BENEFITS OF SUCH AN INTERACTION. THE LATEST TAX BILL, IF YOU LOOK AT IT CLOSELY, ACTUALLY DISCOURAGES THIS KIND OF COOPERATION. AS I UNDERSTAND IT THE FIRM CAN GET A SOMEWHAT BETTER TAX BREAK BY INCREASING RESEARCH AND DEVELOPMENT EXPENDITURES IN ITS OWN LABORATORIES AS OPPOSED TO CARRYING ON THE SAME ACTIVITY WITH A UNIVERSITY. THAT KIND OF ACTION IS A MOVEMENT IN THE WRONG DIRECTION. OVERALL, HOWEVER, I AM OPTOMISTIC ABOUT THE FUTURE. I BELIEVE THAT THE GOOD UNIVERSITIES ARE GOING TO FIND WAYS OF INTERACTING EFFECTIVELY WITH THE FIRMS OF THE NATION THAT HAVE SOME FORESIGHT. WE HAVE ENOUGH PEOPLE IN THIS COUNTRY WHO ARE PREPARED TO TAKE THE LONG-RUN VIEW RATHER THAN THE MORE COMFORTABLE SHORT-RUN VIEW. WE CAN DEMONSTRATE TO THE REST OF THE WORLD THE WAY IN WHICH A FREE SOCIETY OF A HETEROGENEOUS ETHNIC MIX CAN MEET GREAT CHALLENGES AND SUCCEED IN THEM.

Representative RICHMOND. Thank you, Mr. Cyert.

Our last witness is David LeVine, senior vice president of Martin Marietta.

STATEMENT OF DAVID S. LeVINE, SENIOR VICE PRESIDENT, MARTIN MARIETTA CORP.

Mr. LEVINE. Thank you, Representative Richmond. I think I will read the prepared statement, if you don't mind.

Representative RICHMOND. Fine.

Mr. LEVINE. Prior to expressing the convictions that I gained during our visit to Japan, it might be helpful if I briefly reviewed our itinerary and touched on those things that I thought were the highlights of our various meetings and plant tours.

During our visit, we met with Ambassador Mansfield and his staff, officials of the Ministry of International Trade and Industry (MITI), members of the Ministry of Finance, people from the Japan Productivity Center, and visited the plants and/or offices of Sony Corp., Yamazaki Machinery Works, Nissan Motors, and Hitachi and Fujitsu-Fanuc.

From our discussions with the personnel of the two Government agencies and the Japan Productivity Center, it became apparent that there was not a dependence on formal ties between Government, private industry, and the financial institutions. There was, however, no question that throughout the years they had worked harmoniously toward the achievement of common goals. In short, while there has not been a "Japan Incorporated," there is, and has been, a continuing attempt by the various elements to understand each other's viewpoints and problems and this has been reasonably unencumbered by preconceived biases or outright distrust.

The highlight of our trip to the Sony Corp. was the discussion with Mr. Akio Morita, who is the chairman of the board. He philosophized at length about the value of lifetime employment to both the company and to the employee. He spoke of the mutual commitment, lateral mobility, technical training programs, broad intracompany experience, and participative management. One had to be impressed with his dedication toward having a close-knit, family-type relationship throughout his corporation.

The second facility we visited was a machine shop and assembly plant of Fujitsu-Fanuc. Fujitsu-Fanuc is a relatively new company; it really started to grow in 1972 and is now making electric discharge machines, numerically controlled machine tools and robotics. The most vivid impression one had after seeing the plant was that of robots efficiently making robots.

The third location that we visited was the Zama Plant of Nissan Motors, who makes Datsun and by far the most impressive part of that visit involved observing the assembly lines. The plant produced finished automobiles at the rate of two per minute with a work force, space, and inventory levels substantially less than those we experience in the United States. Although the assembly line was not totally unique, the body shop was almost completely robotized with automated spot welders, screw machines, handling equipment, and conveyers.

Finally, we visited the plant of Yamazaki Machinery Works which is producing numerically controlled machine tools at the rate of one every 40 minutes. A majority of the equipment they produced was characterized by automatic tool changers that responded to both preprogramed tapes and unprogramed tool wear or breakage. Most impressively, they were in the process of debugging an automated factory which included 18 integrated, numerically controlled machining centers, an automated warehouse, and various material handling devices. Their goal was to achieve, through the use of these machines and an integrated computer network, a totally automated factory which could be operated by five people on the first shift, five on the second, and none on the third. Their estimate was that such a factory could replace a conventional machine shop employing some 200 people.

From our various visits and discussions with other members of the mission, each of us formed his own conclusions. Mine perhaps are somewhat different than a consensus would be; however, I doubt that they are unique. I will say that in addition to what we saw and heard on our visit, I have also been influenced by numerous articles I have read in the past and a long association with one of our subsidiaries—a company in Japan that is jointly owned by Martin Marietta and Nippon Soda, and I visited there four or five times prior to this trip.

The Japanese management teams and work force are made up of dedicated, conscientious, resourceful, thoughtful, hard-working people. They are members of a homogeneous society, almost totally devoid of the ethnic differences which characterize America and which to some extent are not conducive to perfect communications. They are a people who emerged from the war with a strong sense of shame and a dedication to work together toward a common goal of reconstituting a viable national economy.

In order to do so they recognized their need to peacefully gain natural resources—of which they have very few—through international trade. And so they committed themselves to efficiently producing high-quality items for export. Incidentally, in a world where readily available manufacturing equipment plays a major role in determining efficiency, and where literature, advertising, and international seminars promote the exchange of information, and in consideration of the deplorable condition of their factories following the war, it is hardly any wonder that they have made tremendous gains in productivity. A well-educated, homogeneous, dedicated management and labor force had the basic ingredients for what we have seen happen in home electronics, photographic equipment, the automotive industry, and shipbuilding, and what we are now seeing emerge in the heavy equipment, machine tool and robotics industries.

Incidentally, one must be impressed by the fact that the young Japanese employee is typically extremely literate in a language that has some 2,000 characters. He has been educated in a no-nonsense environment by a curriculum that is heavily weighted toward mathematics and the sciences and he is given extensive technical training by his company in the various disciplines in which he will become involved.

While it is not in effect throughout Japanese industry, nonetheless, lifetime employment is an important factor in many Japanese companies, including all of those that we visited. Lifetime employment to

the worker brings with it a dedication to the future of his company and, therefore, to the quality of the goods he produces. He is interested in becoming involved in the decisionmaking processes which are characterized by quality circles, participative management and consensus decisionmaking.

An interesting survey disclosed that some 73 percent of a Japanese work force responded "yes" to the questions of whether they considered their work to be a part of their lives equal in importance to their personal lives. That was 73 percent versus 21 percent that answered "yes" in a comparable U.S. plant.

Lifetime employment breeds a manager that has been trained and employed in many facets of one company's business. He has become extremely knowledgeable in many of the disciplines and their interrelationships rather than emerging as a skilled finance manager or a lawyer who has practiced only one discipline for various companies. He is sensitive to, and genuinely concerned about, the long-term prospects of his company and all of its employees and he gains satisfaction from the well-being of both.

It is not surprising that the typical union in Japan has, with this coupling of dedicated employee and sensitive manager, been structured within a company rather than being organized by trade or industry on a national basis such as we are. It is also not surprising that the relationship between it and the management is inherently constructive.

While we are not likely to formally accept lifetime employment, there have been emerging very positive trends in our own relationships between labor and management. Quality circles and succession planning have become more prevalent. Unions have moderated their requirements for wage increases in consideration of a company's financial situation. Labor and management are speaking more openly and the mutual interests of workers and management are more readily acknowledged. I do personally believe that furthering this movement is indeed possible by various means. Profit sharing plans plus employee stock participation are pluses and should be encouraged. Conversely, terribly large management bonuses and highly selective stock option plans are minuses for they tend to reward the near-term results of a few while they generate some amount of ill will among many.

Another element that relates to long-term productivity improvement deals with the subject of research and development. While we here in the United States do, in fact, engage in substantial research and development efforts, a great percentage of it has been geared toward defense requirements and the medical and agricultural arenas. The Japanese emphasis, on the other hand, has been toward new product development and the manufacturing techniques that are necessary for high-quality, low-cost production. The recently passed tax bill should be helpful toward revitalizing our industrial research and development programs; however, there is perhaps another means that could be employed. Other government agencies that purchase material or equipment might examine the manufacturing technology (Mantech) and technology modernization (Techmod) programs of the Department of Defense which have been adopted in order to further inspire productivity at no increased cost to the Government.

I might digress a little bit here and just give you a for instance. The Government does buy one whale of a lot of coal and one of the least efficient, least productive elements of our society these days is underground coal mining and it's never been very productive, but it got even less productive when the Mine Health and Safety Act demanded that workers be better trained, that more safety precautions be in place, that safety inspectors be almost at a ratio of 1 to 2, and with the advent of MHSA, coal mining became a great deal less productive—underground coal mining.

An adaptation of Techmod or Mantech that the Government might apply would be to a company such as Peabody Coal Co. from whom they buy a great deal of coal, jointly sponsor for the sake of argument $20 million of research and development toward robotizing some of the jobs of an underground coal mine with the understanding that having spent the $20 million, the next year's coal supply would be bought at $28 a ton instead of $32 a ton. It's the kind of thing that DOD is doing in Mantech and Techmod.

Insofar as encouraging investment in new facilities—something which the Japanese have long done—the provisions of the new tax bill which permit more rapid depreciation will surely help. Obviously, full benefits of that bill will not be realized until our interest rates decline to a more modest level. However, I have no doubt that when that does occur, and the advantages of rapid cash return are fully recognized by the entire business community, we will indeed accelerate our investment level in more efficient plants and equipment.

In summation, I believe that there are some important advantages that the Japanese manufacturing establishment has gained. I believe the issue of attaining increased productivity is extraordinarily complex and can only be addressed by thorough analysis and by instituting a number of programs, each of which will play only a small part in reversing the recent trend. I do sincerely believe that we can do that, however, it will surely require a deep understanding, a concentrated effort and a great deal of patience.

Representative RICHMOND. Thank you, Mr. LeVine.

Let me ask a series of questions of you four gentlemen. Four things bother me and if any one of you has a comment I would appreciate it.

Lifetime employment. Now you know very well when you have an increasing economy, when the volume goes up every year, and the sales increase throughout the world, it's very easy to have lifetime employment. You all recall the last visit we made to the Hitachi Co. and they were telling us they have lifetime employment; yet, if you read their annual report, you would have seen between the year 1972 and 1974 suddenly 20,000 people no longer became "lifetime employees" because the firm went down from 180,000 workers to 160,000 workers. Therefore, they don't really have lifetime employees.

What Japan has been doing is increasing its volume every year and therefore, naturally, you keep your workers busy. So I would say Japan has lifetime employment as long as it's convenient for them to have lifetime employment, and when volume drops they are certainly not going to go bankrupt.

We also know that there are two classes of employees in Japan—those "lifetime" employees who wear white hats, and then the temporary workers who wear, in the case of Nissan Steel, yellow pants,

and they are second-class workers and they come and go. Japan has an enormous substrata of subcontractors who hardly would be considered lifetime employees. That's one item I'd like to mention.

My second item: What are Americans ever going to do with this problem of short-term versus long-term profits? Our own capital system, our stock exchange, our markets, demand that every corporate executive issue a quarterly report on the progress of his company. Now many people don't take quarterly reports very seriously, but they certainly take annual reports seriously.

How are we going to adapt—sure, it's a great idea to work toward long-term profits, but under our own capitalistic system there's no way that the people will buy stock in a company that's not showing or going to show earnings 5 or 10 years from now. That's my second problem.

My third problem is the superbly efficient, the miraculous method of Japanese savings. Here you have your interrelation between your bank and your business. The bank finances the business. The business has a branch of the bank right in the factory. The business pays out biannual bonuses. You can bet your bottom dollar that most workers put that money right in the bank in the factory. The money from the branch bank goes right back to headquarters and it gets right back in the company again. The workers get 6¼ percent interest on their savings or 5⅞ percent interest on their savings, and the bank then loans the workers' money right back to the company at 6¼ or 6½ percent. So you get this lovely little combination where the bank owns stock in the company; the bank has a branch in the company; the company's workers bank at that branch; the money goes right back to headquarters and right back into the company again.

As Mr. Porter mentioned, the savings rate against the consumption rate—how are we going to keep the American people from buying so many things they don't need? The Japanese Government has succeeded in keeping the Japanese people from buying an awful lot of consumer goods.

First of all, they kept housing very tight, kept the size of housing very small. As a result, there just literally isn't room for Japanese people to buy. You know, the Japanese Government has planned this beautifully. They've kept their roads in terrible condition. Their roads are probably 40 or 50 years behind ours. We drove to the Hitachi factory on a two-lane road which was the same thing you might have driven on 50 years ago. So they intentionally kept their roads down to keep people from buying automobiles and, thus forcing them to use mass transportation.

They have intentionally done little or nothing about housing in order to keep people tightly compacted, to keep the people from buying consumer goods. We all know the one way to sell consumer goods in the United States is to have a housing boom. Once housing starts up you sell your carpets and appliances and furniture and buy new ones. Our Nation is a nation built on an automotive and housing economy.

Now the Japanese have very neatly circumvented their citizens by not building roads so people don't want cars and making houses very difficult to acquire. What do we do about that?

And last, and certainly most importantly, what do we do about the fact that the Japanese are almost 100 percent literate and really literate. Somebody mentioned in order to be literate you have to be able to identify 2,000 characters. What about some of our children who can't identify 500 American words? Now what are we going to do about those four major problems?

To me, those are the things that are dragging the United States behind and forcing the Japanese ahead of us. Robots come and go. I've been in this business all my life. If it's not a robot, it's an automatic transfer machine. I started out building transfer machines in 1949, so robots are fine. They're just a natural development of manufacturing. How do you get people literate? How do you convert savings out of capital? Those are the things that really bother me.

Does anybody have any answers?

Mr. LEVINE. I'll try one or two of them. As far as lifetime employment is concerned, I don't think there's any way we're going to go to lifetime employment. After we came back from Japan, I had the opportunity to spend some time with my 25-year-old son and about four of his friends and got gassing with them about lifetime employment, and they thought that was absolutely abhorrent, that they would come out of college and want to go to work for one company and be dedicated to work for that company for the rest of their lives. So if it's tough for a company management to manage lifetime employment and cope with it, my feeling is that the young American that goes to work doesn't want to be committed to lifetime employment either.

The answer is not to look to lifetime employment. The answer is to look to an educational process whereby American management cares about the employee and tries to make him a lifetime employee. It's a care that says if there's going to be a little peak in the business I'm not going to hire a number of people and put them on my payroll if I think I'm going to have to lay them off in a year and a half. It's a care that says rather than going out and hiring some more employees, we will work overtime for 6 months. It's a care that says rather than lay off some employees during the slack season, we'll train them in other aspects of the business. I'll sacrifice some amount of short-term profits in consideration of the employee. We're not likely to have lifetime employment and we're not likely to guarantee permanent jobs, but it's an educational process to get American management to believe and to care about every employee in his company.

Now, I don't know how you get from here to there, but I think that's the only direction possible.

As far as reducing the amount of spending on consumer goods, the Japanese did some other hard-nosed things. I was impressed—while I was there I bought a camera and the camera I bought was on sale, tax free to me as a U.S. citizen for $110. I have seen the same camera here in the United States for $110 and to the Japanese in Japan that camera was $160. That's how they discourage luxury buying.

Now we could do that tax wise or perhaps in some other way if we really want to discourage luxury buying.

Representative RICHMOND. Of course, you know, they have been talking about having a luxury tax on luxury goods in the United States.

Mr. LEVINE. I would also just make one other comment on the basis of my own experience, and that is the short-term versus long-term problem, how do we get our management to think long term, not short term; and there are an awful lot of us that do that.

Representative RICHMOND. How do you get your management to think long term and your stockholders to think long term?

Mr. LEVINE. What the stockholders think is only one factor. One of the businesses we're in happens to be the cement business and when one builds a cement plant these days it typically costs us about $100 million. It takes 2 or 3 years to build it. We know perfectly well that we won't operate at capacity, perhaps until the 7th year of its operation and we know perfectly well it's a losing proposition for the first 5 years.

Representative RICHMOND. But you already have 25 divisions that are making money, so it's very easy for you to go into a new one that's going to lose money.

Mr. LEVINE. Sure, but it's too broad to say how do you get American management to think long term, and I'm saying there's a lot of long-term thinking. You can't think long term if you don't have some money in the bank to survive on a long-term basis.

Representative RICHMOND. Mr. Porter.

Mr. PORTER. Let me make a couple observations, first about Japanese savings and consumption, and then about lifetime employment.

One of the things that's important to remember about Japan is that the workers typically retire at a much earlier age than American workers. The average age is about 57. Many retire about 55. The labor shortage problem that Mr. Cyert mentioned has prompted the Japanese Government to undertake a number of measures to try to induce people to work longer. They do live longer. Their average life expectancy for women is 79.8 years and for men it's 78 years. So for the average Japanese worker, he can anticipate living between 20 and 25 years on average after he's retired from his job. Couple that pattern with a much less generous social security system that the Japanese have and you find a powerful built-in incentive for the Japanese worker to save a large portion of his wages for his future pension.

These incentives are complemented by a deliberate Government policy of trying to induce savings through their postal savings plan and through various pension schemes somewhat like our IRA and Keogh programs.

You may recall that we questioned at length the Vice Minister of Finance in Japan about the kinds of tax advantages available to Japanese workers, he indicated that if workers appropriately distributed their savings, so much in postal savings, so much in a pension plan, that, the worker could shelter up to $70,000 of income.

Representative ROUSSELOT. Is that the interest on the savings or just all income?

Mr. PORTER. It includes interest and ordinary income.

Representative ROUSSELOT. And how much is the exemption on interest paid on savings.

Mr. PORTER. It is all considered part of total income.

Representative ROUSSELOT. They have a very big tax incentive to save?

Mr. PORTER. Yes, there is an incredible tax incentive. If you combine the fact that a person is going to have to live off their savings for a long period of time, that they are unlikely to get generous social security benefits from the Government, and that they have tax shelters through savings, it is no great wonder that they have had a 32-percent savings rate.

There are also disincentives to consume in Japan which you mentioned, Congressman, and that I found in a very similar experience as David LeVine's in terms of purchasing a camera. While in Tokyo I purchased a camera and brought it back to the United States and discovered that I could have bought it for slightly less here, even though I got it on sale and with the tax-free rate in Japan.

Representative RICHMOND. But it's a lot more fun buying it there.

Mr. PORTER. Yes. Let me mention one thing about lifetime employment. The concept of lifetime employment is, as you pointed out, somewhat overstated in Japan. The most reliable figures that I have seen are that only about 30 percent of the Japanese work force enjoy what we have come to refer to as lifetime employment. Many people have observed that Americans know very little about how their economy works or about the free enterprise system, but I was struck 5 years ago by a Gallup poll which asked people what they like in the United States and what the free enterprise system meant to them. The single characteristic that was most important to the largest number of Americans who were polled in this survey was that the free enterprise system meant they had the freedom to choose the job they wanted and the ability to change that job at any time. Also the fact that 1 out of every 4 Americans moves each year, and that we are a much larger, less homogeneous, and mobile society, suggests to me that lifetime employment practices of a coercive or mandated form are unlikely to succeed in America.

I would underscore David's point that what American management needs to do is to try to make working in a particular enterprise more attractive in order to retain employees, rather than thinking that if we moved to lifetime employment somehow this would solve our labor problems.

Mr. HORMATS. May I add a couple of thoughts to that? On the question of savings, one of the very interesting things, if you compare the Japanese and American tax systems, as Roger pointed out, is that the Japanese tax system provides incentives for savings. The United States has an incentive, in effect a subsidy, for borrowing in the way the tax system works because you can deduct a part of the interest payments you make. In effect, our tax system provides a Government subsidy to those people who want to borrow and get credit for housing or for refrigerators or whatever you care to mention. I think that, in itself, is an interesting difference in the way the two tax systems work.

I would also add one point that concerns the way the Japanese bonus system encourages savings. Instead of getting the same amount of money every week, at the end of a period of time, for instance a year, you get a very large bonus. We know from the way psychology works that people have a much greater tendency to save a bonus they've gotten at the end of the year than to save incremental amounts of money they might get every couple of weeks.

Another element of the bonus system is quite unique, particularly when you compare it to Europe. Europe has a system of indexation. Wages are, in effect, based on the rate of inflation plus a certain amount of labor bargaining. To a degree, that is happening here. Although it's not institutionalized, it's built into the psychology of many wage negotiations.

In Japan, it's quite different. In a bad year the firm will simply pay a normal base amount. That way it doesn't have so much built-in overhead in terms of wages. In good years it pays out a very substantial bonus. This practice means that a firm in a bad year won't have to lay off a lot of people in order to pay higher wage rates, and in very good years, of course, everybody stands to gain. I think that is a very useful way of relating wages to factory productivity and growth; quite different from the way we're doing it and Europe is doing it.

On the question of lifetime employment, I think you're right in pointing out there is a difference here. I would take some issue with the point that the Japanese have had to do all these things because of shortages in the labor force. Western Europe had a shortage in the labor force in many instances, and they imported a lot of workers, a practice the Japanese society doesn't permit for many ethnic reasons.

The other thing is that Japan doesn't use its overall labor work force very well. Women, for instance, have a tertiary role in the labor force. We in the United States have managed to bring women in at a relatively rapid rate—perhaps not so rapid as it should have been—but particularly compared to Japan, at a much more rapid rate in the higher level professions. Moreover, in Japan, women, to the extent they are brought in, are expendable workers. When the economy tails down, those women are turned loose. So they have almost no security in terms of their jobs. One reason they have adopted this practice is that their social system does not enable them to use the workers they have, very effectively. In addition, they have enormous labor redundancy in the service sector and, for social reasons, have not moved as many people out of the service sector—where they often do very menial tasks—into the manufacturing labor force.

It's not necessarily the case that over the next several years we will have labor shortages which will alleviate our unemployment problem. We have a rather unique structure in our labor force here—different from Japan where it's homogeneous. We have a two-tier labor force with a very large number of untrained people, where robotics can take over. I think that we may have our shortages at the top levels, and among technicians or middle level workers, but I'm afraid such shortages won't ameliorate the structural part of the U.S. unemployment problem.

The last point is training. The Japanese and United States are heading in different directions in terms of quality of training. The Japanese are building a lot more substance into their training in functional and technological tasks. The United States will encounter enormous problems unless there's a more effective training system, and the educational system dramatically improves to accommodate these needs over the next decade.

Representative RICHMOND. Thank you, Mr. Hormats. My time is up. Representative Rousselot.

Representative ROUSSELOT. Thank you, gentlemen, for your testimony today. I, too, had a chance to be in Japan with the Ways and Means Committee, the Trade Subcommittee, and those of us that had not been there before were fascinated by what we saw and what we tried to learn.

Isn't it true, Mr. Hormats, that the Japanese have tended to emphasize specific training for job placement? They have more of a trade-school type of operation. Don't the Japanese direct their training to specific areas of education where maybe—with the exception of California junior colleges—our educational system has been far more general in the way we do not tend to train for specific jobs?

By the way, how is the State Department doing in promoting U.S. exports? Would you talk a little bit about that?

Mr. HORMATS. I think we are doing better.

Representative ROUSSELOT. I hope so.

Mr. HORMATS. We're trying. We have been working very closely with the Department of Commerce and the U.S. Trade Representative and the Department of Agriculture in promoting exports in several ways. One, working more closely with American firms that have trade problems or investment problems abroad. The Secretary of State has sent out a cable to all the ambassadors indicating this is an important part of their overall responsibilities. I've met with a number of the new ambassadors going out to tell them what we're doing and what they can be doing in the area of exporting, and I think, in general, the performance and enthusiasm in this area has improved rather dramatically. The American firms to whom I've spoken feel this is the case as the Department of State promoting U.S. exports?

Representative ROUSSELOT. Do any of you want to comment on that?

Mr. CYERT. I might comment on the previous questions, but not on this one.

Representative ROUSSELOT. Fine.

Mr. CYERT. I think the four points that Congressman Richmond makes are all interesting and important. I think it is easy to exaggerate their significance in terms of understanding what is going on. I do not believe a lifetime employment factor is a major element in the Japanese system. Even improved labor-management relations can be highly exaggerated.

The evidence in the literature is that one can have high productivity with low morale in one's work force and low productivity with high morale in one's work force, as morale is measured by psychologists. One may argue with the measurements, but the variable is again one of those things which commonsense might think might be the relationship but when the relationship is studied it does not seem to be there.

The rate of savings is easy to increase. All we need do is increase the uncertainty in the economy. If you want to get people to save more, the simple way is to destroy many of the things that we have done to build security. The Japanese rate of savings will come down dramatically as their economy develops and as they get increased certainty in their system. This is a factor I'm quite certain is increasing their rate of savings.

Representative ROUSSELOT. You don't think Japanese tax incentives have any role in their savings rate?

Mr. CYERT. My guess is it would be marginal. I think the uncertainty is the big factor. You don't get those things without something dramatic in the system and it's the uncertainty with respect to old age.

Representative RICHMOND. Also, the lack of inflation.

Mr. CYERT. Well, inflation will tend to increase the amount you would like to save.

Representative RICHMOND. Inflation will tend to decrease the amount you save because you'll wipe out the savings with inflation.

Mr. CYERT. That's one factor.

Representative RICHMOND. That's our present problem in the United States.

Mr. CYERT. There's no concern about what you're going to have when you retire in our society. You just count on social security. It means that you're concerned about other factors.

Representative RICHMOND. I can give you an example. This Christmas will be the biggest Christmas in the history of the United States. People will just wipe out the stores on the theory that they might as well buy it now and use the money they have rather than saving the money, which is a terrible thing that's going to happen.

Mr. CYERT. Inflation is a bad factor in that, but it also has some elements in the other side since it increases the uncertainty.

On the education side, that is a factor that is important and would be nice to have in this country, but it is much more difficult. Now I think one of the big elements in getting a greater emphasis on long-term versus short-term outlook in management is having boards of directors who are a little more sophisticated and understanding. I happen to be on a number of boards. I know how they tend to behave with respect to executive compensation. The tendency is to make the so-called long-term compensation plans, the average rate of profits over 3 years or 5 years at the most. We've got to get some thinking on executive compensation which really increases that period of time. That would be one factor I think to increase.

I'd like to comment on a couple other points that have been made. Mr. Hormats has already answered his disagreement on the effect of the labor factor by pointing out in Europe they used immigration, imported labor, which they had there, and that is one answer to a labor shortage. The Japanese had looked at that in 1974, then had a slight recession and discarded the idea. When the economy began to move again they moved in these other directions. So I would emphasize that the demographics are important in deciding it.

The concept of a two-tier labor force is one of the long-run illusions about the labor force. We hear whenever we have a higher unemployment rate that there's structural employment. If we go back and look at the data, when the economy was moving at a very rapid rate, as in the early 1960's, after the Kennedy tax cut, we find unemployment going way down; the so-called people who are structurally unemployed are suddenly employable, and that factor disappears. I don't believe it's a good way to think about the labor force. There are ways of hiring and using a lot of people when the demand gets great enough. So I want to emphasize strongly we're going to have the labor shortage on all levels in this country and it is important to be prepared for that kind of activity.

Representative ROUSSELOT. I wonder if any of you could comment further on the lifetime employment thing. As was indicated by one of you, our understanding—those of us that were in Japan when the Ways and Means Trade Subcommittee went there—was that only about 30 percent of the companies really provide lifetime employment and the so-called subsidiaries or lesser companies or feeder companies to a much lesser degree offer lifetime employment. To a degree it hasn't been emphasized that only a small percentage of the Japanese work force really has a lifetime employment factor. Is that your understanding or have I misunderstood you?

Mr. LEVINE. I think the number of 30 or 32 percent of Japanese workers who are lifetime employees is a correct number generally, but if you look at the industries where they are, it's basically in the manufacturing export trades; that is, automobiles, radios, Sonys. There, the percentages are a great deal higher than that.

Representative ROUSSELOT. So in the export area, are those basically the corporations that are providing it?

Mr. LEVINE. And the little "Mom and Pop" home industries in the very small locally produced, locally sold things, they are not; and that's what drags the percentage way down.

Mr. CYERT. I have been looking at the steel industry and there the estimates are that 70 percent are on a lifetime employment basis. This, incidentally, is something that we have not talked about and doesn't relate to productivity in the economy. However, it relates to the success of the economy and was implicitly talked about by the pricing policy on cameras—the whole notion of the way in which Japan does handle exports. It does conform to the classical case in economic theory of what is called dumping, where you divide your market into two parts and have a high price in one—in this case the domestic market—and you have a lower price in the foreign market. So the whole notion is to get the economies of scale from your manufacturer. One can show very easily where you have these two different kinds of markets, your profits are a lot larger. There's no question in my mind, although not everybody agrees on this, that in steel particularly, because of the large amount of fixed costs that the Japanese have, that there is a great incentive to sell at something that will cover a variable cost and to be able to gain greater income in this fashion to lower the cost of production. So I think this is a major factor.

Mr. HORMATS. May I just second that point and elaborate on that? I think that's right. The traditional thing in Japan is to build up a certain amount of domestic demand for your product in a protected way and then you can sell it at a much lower price abroad. One area that's particularly interesting, and the lesson we were obsessed with getting access to the Japanese Nippon Telephone-Telegraph market, is just this: They provide particularly good prices for Japanese producers of high technology equipment—computers, integrated circuits—anything you care to mention which goes into the telephone system. By providing those very good prices they make it easier for these same firms which have built up a large volume business in Japan to sell more cheaply abroad. We felt one way of helping to deal with the fact that they could compete so nicely over here is for us to be able to compete in their home market effectively and to get into the nice little deals they have internally. That's very hard to do.

Representative RICHMOND. You know, the Nippon Telephone-Telegraph deal still hasn't gone through.

Mr. HORMATS. Well, it's gone through, but we haven't seen many results.

Representative RICHMOND. They're doing everything possible to make sure there will be no results. They give us 30 days to bid and then they said the bid had to be returned in Japanese.

Mr. HORMATS. I think there has been a lot of frustration there, and I hope the Japanese will realize putting it down on paper is not good enough. There have to be results and meaningful results. Hiding in a relatively protected market, using almost an infant market approach, building it up well beyond its infancy until it becomes effective and then saying let's have free trade in this sector is essentially the way the auto industry and steel industry worked, and that's what they have had.

Representative RICHMOND. Where is American industry going to get the money to retool, to rebuild and modernize? We have all established the fact that lifetime employment doesn't work. We have all established the fact that the American worker is just as productive as any other worker in the world, if not better. But the one big problem we all understand is the retooling of the United States, a multitrillion-dollar operation, and nobody is even beginning to think of where we're going to get the money and how we're going to spend it.

The average factory in the United States right now is maybe 15, 20, or 25 years behind many modern Japanese factories. I think, David, you and I know that from just walking through other people's factories. The average manufacturer has spent so little money due to the antiquated depreciation program we've had, due to his profit-sharing bonus—nowadays, unless you offer a topnotch manager a decent profit-sharing bonus you'll never get him or her. You have this great disparity between what our workers make and what our managers make.

As you know, in Japan, the highest paid manager makes $250,000 a year, as against the average factory worker making $20,000. In the United States, the average factory worker makes $20,000 and a well paid manager of a major company makes a million dollars a year and you're not likely to——

Representative ROUSSELOT. I don't think that's the average pay.

Representative RICHMOND. A well paid manager of a major company will be making a million dollars a year as against your average factory worker making $20,000, whereas a well paid Japanese manager makes $250,000 a year. So you get this terrible disparity and what I'd really like to know from all of you brilliant men is where are we going to get the money to retool the United States, No. 1; and what plans does the administration, Mr. Porter, have to begin training young people for jobs that will be available?

We have a terrible problem in the United States of illiterate, untrained personnel. Now Mr. Cyert says we're going to have a shortage of personnel. I had testimony just the other day that in Boston apparently you cannot hire a computer worker. Every computer company on Route 28 there is looking for people. There's no way that they can take any more orders in Boston on computer technology because there just are no more properly skilled people in Boston. Yet throughout the United States we have terrible unemployment because the

people who are unemployed are untrained, don't have work habits, are illiterate, and nobody is doing a blessed thing about training them.

Now there are those two major questions. Where are we going to get the money to retool our factories, and where are we going to get the drive to retrain our people? Wouldn't you say perhaps those might be the two basic ills of the United States at the moment?

Mr. CYERT. I think those are important points.

Mr. PORTER. Let's look at the first one for a minute.

Representative ROUSSELOT. I hope I get to finish my questions sometime.

Representative RICHMOND. I'll yield right now.

Representative ROUSSELOT. I'd like to hear the answers to your questions first.

Mr. PORTER. Let me take a crack at the first one. I don't think one ought to underestimate the impetus to investment that will be achieved through the recently passed economic recovery program and the tax bill. It is much more advantageous now through the new depreciation schedules for American businesses to invest. They will have something on the order of $10 billion more in retained earnings at current profit levels in the coming year as a result. One can expect increased savings rates through the marginal rate reductions in individual income taxes. The last time marginal tax rates were reduced the personal savings rate went from 6 to over 8 percent. I think the likelihood is high that the program now in place will dramatically contribute to capital formation in the United States.

But we must wait and give it an opportunity to work. At the same time, we should encourage business and industry to take advantage of the provisions in the tax bill to invest. David may be able, from the standpoint of someone who is on the receiving end, to comment on whether the tax bill is likely to provide adequate incentives for people to undertake the investments that we are talking about.

Mr. LEVINE. I think there's no question that it will. I think you have to couple it—the new tax bill—basically what it does is give you a cash payback in a much shorter period of time. Now you've got to couple that with a hope that interest rates come down somewhat and also industry needs a little time to totally understand the benefit that the new tax bill gives them. That may sound simple, but it's true. It just takes a little time for business to understand.

I went through an interesting analysis the other day. We are considering a substantial capital expenditure program and what we did was itemize the capital expenditure program, which was some $230 million. We broke it down into its elements and got the finance people in the company to analyze how long it would take until we got our money back, $230 million, and just on a cash flow alone, not from profits coming from the investment, we recovered 50 percent of it in 3 years vis-a-vis the new tax bill, 85 percent in 5 years, and all of it in 8 years. And that's a big impetus toward making investment.

Mr. PORTER. The other thing that must happen if we are going to have increased investment in the United States is that we must reduce the role of the Federal Government in the capital markets. If you look at the period in the United States from 1950 to 1975 and ask what were Federal credit demands, demands for on-budget deficit financing, for off-budget Federal direct loans, and for Federal loan

guarantees, you find that the percent of the money in the capital markets that the Federal Government was preempting ran between 25 and 32 percent. It was up and down, but it stayed within that range during the entire 25-year period.

Federal credit demands took off in 1978. They went to the mid-30's in 1978, to the high 30's in 1979, to the low 40's in 1980, and in 1981 the Federal Government will preempt 46 percent of all the funds in the capital markets.

It is no wonder with those kind of Federal Government demands why there is a lack of adequate investment and why we have such high interest rates. There is nothing more important in getting interest rates down than reducing the Federal Government's demands in the capital markets.

Representative ROUSSELOT. Good point. Representative Richmond, I have a whole slew of other questions. How important are the quality circle operations in Japan in their ability to improve productivity? We went and visited several plants that are very active in that kind of thing. It seemed impressive and some of you have commented briefly on this in your prepared statements. But how much of a factor is that really?

Mr. CYERT. We had an interesting experience. We visited Sony and Mr. Morita was extolling their virtues. We then visited the robotics plant and Mr. Inabi was saying he didn't think they amounted to anything. I'm inclined to agree with Mr. Inabi. That's perhaps a little too strong. There can be a factor there. It's easy to exaggerate the significance, though.

Representative ROUSSELOT. Have you all read "Theory Z"?

Mr. CYERT. Yes.

Mr. LEVINE. Yes.

Representative ROUSSELOT. He places some emphasis on it, but that is not the only thing he brings out.

Mr. LEVINE. I would give you one man's experience with quality circles. In our aerospace part of our business we do have quality circles and in one plant we have made extensive use of quality circles. The ideas that really come out of it are not very important in a contributory way. The atmosphere that it helps generate among a number of workers who have never worked with their fellow man on a problem, who have never had access to company records which they are allowed to research in order to work the problem, who have never interfaced out of their own department in order to work a problem, is invaluable. I think it's a plus, psychologically. I don't think that it's a plus otherwise.

Representative ROUSSELOT. But it's not a major——

Mr. LEVINE. It's just another scheme toward motivation, toward getting an employee interested in being more productive, and out of it too comes an interest in producing a better quality product; and the two really are interchangeable.

Mr. PORTER. One needs to remember that quality circles are a relatively recent phenomenon in Japan. As late as 1974 they only had about 1,000 quality circles, and they grew to 87,000 4 years later. The big burst in Japan's productivity which, like virtually every other industrial country, has declined since 1973, did not come from quality

circles. My impression is fairly similar to Mr. Cyert's in terms of the contribution that they really make.

They are good in a psychological sense. The number of suggestions that emerge from quality circles that make a dramatic difference in the rates of productivity, I think is often overstated.

Mr. LEVINE. I'll tell you that in the departments where we have quality circles—and this is for 2 years now—they really do have less lateness, less absenteeism, and less turnover of employees.

Mr. CYERT. This was the big reason why the Japanese started it. They were really concerned over this whole question of turnover.

Representative ROUSSELOT. OK. So, that is more of a rationale for its continuance than for productivity.

Mr. LEVINE. It's another thing that's not a cure-all. It's a step in the right direction.

Representative ROUSSELOT. Mr. Cyert, you mentioned and gave great stress to our major hope for increased productivity is better use of robotics. Will our companies on their own make the investment or set up the subsidiaries as so many Japanese firms do to build their own robotics? A lot of it has been internally generated in Japan. Are we going to do that?

Mr. CYERT. I think we will do it. We won't do it as rapidly as I would like to see.

Representative ROUSSELOT. Why not?

Mr. CYERT. I think there's a problem with the whole question of long-range views. I think this is one of the really serious factors in making investment in the long run and there's going to be some hesitancy until it's much clearer that this is the route to go.

Representative ROUSSELOT. Why is it not clear here that that's the route to go? I mean, it's impressive when you look at some of their plants and see 20 people running a plant that produces an awful lot of engines.

Mr. CYERT. I just toured an important plant and the company officials were telling us about how much money they had just recently spent in machine tools. There wasn't one Japanese machine tool in there. I asked them about it because I had already seen more advanced tools in Japan. The fellow said, "Maybe we made a mistake at not looking more closely at what the Japanese have to offer. There's a real hesitancy to move in and buy the more advanced tools that are using robots.

Representative RICHMOND. What about our own American industries? Aren't they doing it?

Mr. LEVINE. They're doing some things, but they certainly seem to be in back of Yamazaki.

Representative RICHMOND. Cincinnati Milacron is the world's largest machine tool company and has the world's highest quality, and they are behind a little company like Yamazaki?

Mr. CYERT. In terms of the most recent tools, they were not up to the things we saw in the Yamazaki plant. Now I'm not a great expert in that area and I'm going on a limited number of observations, so I could be wrong on that, but that would be my answer at this point on the information I have.

Representative RICHMOND. What bothers me is not that American companies don't have robots all over the place, but American com-

panies don't have modern material and equipment like conveyor equipment and progressive dies. I went to a factory recently, a stamping plant, where people were just literally carrying the stamping die from one place to another. Twenty-five years ago we designed progressive dies to take care of that and American industry is really frighteningly antiquated. That's where we're losing our markets.

Mr. CYERT. One of the factors is that we have been relatively insulated against foreign trade for a long time and people haven't thought in those directions.

A second factor is one that I am familiar with—and my analysis may or may not be correct. I believe that one of the things that's happened in this country is that we have had a change that began back in the 1950's in the nature of our business schools. As a result, we have driven out certain areas that had previously been concerned with the manufacturing process.

Specifically, industrial engineering departments around the country have traditionally been concerned with time and motion study and a variety of topics that in themselves were not necessarily big things, but they turned out people out of these departments who were concerned with the manufacturing process. So their attention focus was on manufacturing. In the 1950's we began to develop business schools that were utilizing many mathematical techniques and began to develop computers. Those industrial engineering departments that were in universities where they didn't have modern business schools began to adopt these things themselves. They dropped time and motion study and picked up operations research, and the business schools as they developed began to turn out people interested in accounting and finance.

Engineers never really quite liked that whole manufacturing emphasis in mechanical engineering and under the influence of the NSF policies in the 1950's and 1960's they wanted to become much more scientific. So what's happened is industrial engineering departments have fairly well disappeared. Where they exist, they are like the modern business school. The modern business school is interested in finance and accounting and nobody has been turning out anybody who would be called a maufacturing engineer. People may get into it by accident.

Whereas, in the Japanese companies, there is, if anything, a surplus of so-called industrial engineers.

I thing we're beginning to move back into that process now. I would say over the next 10 years there are going to be a lot more people coming out of universities who are themselves manufacturing oriented. I think we will then begin to see more of these systems that are old being improved.

Representative RICHMOND. What are we going to do about the millions of untrained, illiterate teenagers wasting your tax dollars and mine doing nothing, giving the Government nothing, taking everything they can get, and producing nothing? Now this is the great potential of the United States. This is the raw material of the United States. And this administration and even the last administration—for 3 years, we literally haven't had a policy of what to do with this vast amount of manpower that's wasting its life away. Does anybody have any idea what to do? Fifty percent of the teenagers in my district

are unemployed. Now you know a teenager, an unemployed teenager, is going to get in trouble.

Mr. CYERT. Plus the fact that a high percentage of them are black——

Representative RICHMOND. Black and Hispanic, but the fact is that they are all school dropouts because they weren't sufficiently interested in their courses in school to stay in there. They left with maybe only 1 year of high school, if that, and they have been hanging around the street corner ever since. We're talking about millions of people. Now you say we are going to have a labor shortage. What are we going to do with these people to eventually get them to become taxpayers instead of tax takers?

Mr. CYERT. Well, one idea I have discussed recently with a major steel company is perhaps a drop in the bucket to this, but is a move in the right direction. Many of these teenagers, particularly black teenagers, are employable or have been employed in small businesses. One of the things that we're talking about doing or trying to do in the Pittsburgh area is to see what can be done to help small businesses survive. A high percentage of these, as you know, are started and fail quickly and go into bankruptcy.

One maybe long-run thing would be to have an intensive effort made to give better advice to some of these small businesses to try to maintain a higher rate of survival. These businesses, in turn, are going to be employing some of these black teenagers, and we might at least have a move in the right direction if we could get something like this going nationwide. So I think there is some hope on that side. I'm not saying it's the panacea, but I think it is a movement that could be good because, again in small business, these people get some training and they're the kind of people who can learn training best by doing.

Representative RICHMOND. I'm told the best place for starting an unemployable minority person would be a small business rather than a large one.

Mr. CYERT. Right.

Representative RICHMOND. Roger, isn't that something the administration could give us a policy on? The President says he believes in voluntarism.

Representative ROUSSELOT. He also believes in free enterprise. There's the Kemp-Rousselot bill. Are you on that?

Mr. PORTER. It seems to me there are a couple points worth making. The first is that it is very difficult when the headwaters are poisoned to depollute downstream, and the headwaters in this case are the educational system. When you have an individual whose productivity is negative—that is, for whom it is not worthwhile for an employer to employ—it is very difficult under any circumstances, through any program, to get them a productive job in the private sector without having a basic educational background. So the first step that needs to be taken is to get an educational system in this country which is producing people that are functionally literate.

Second, the administration——

Representative RICHMOND. What's your administration doing about it?

Mr. PORTER. Second, the administration has supported the recently extended targeted jobs tax credit which provides for a payment of up to 50 percent of an individual's salary in the first year up to $6,000, and 25 percent of their salary in the second year. This is available for employers, large and small businesses, to use for individuals who are economically disadvantaged between the ages of 18 and 24.

Representative RICHMOND. Large corporations wouldn't be interested, but as Mr. Cyert says, small businesses might very well be interested in something like that.

Mr. PORTER. Most of the businesses taking advantage of the targeted job tax credit will be small businesses. One of the things we are trying to work out now is to get, one, a better dissemination of information about the program to small businesses; and two, to make it as simple as possible for them in terms of filing their tax returns so they can take advantage of it. The emphasis is on not creating make-work government jobs, as has frequently been the pattern in the past, but to try to find them productive employment in the private sector.

One needs to remember that there is an awful lot of training that goes on now in the private sector. The private sector spends in excess of $30 billion a year on training. To the extent that you can make available to a private firm an individual who is functionally literate, firms are quite prepared if they have job vacancies to train them for the specific task that is being performed by that company. But they are not in a position to step in and fill in a tremendous gap that the basic educational system has created.

Representative RICHMOND. Congressman Rousselot.

Representative ROUSSELOT. What do you think about that?

Representative RICHMOND. About this massive amount of waste of raw material in the United States?

Representative ROUSSELOT. You're talking about people.

Representative RICHMOND. Millions of unemployable people.

Representative ROUSSELOT. Well, I'm going to have to make you become familiar with our enterprise zone bill because that's one of its purposes, to try through the areas which you have just spoken to encourage primarily small business. We had hearings on this a week ago Friday on the subject with quite a few people knowledgeable about urban job creation. To some degree Taiwan has provided an incentive for a small business to come in and start up or expand a business, but one of the major problems was excessive government regulation or taxation, both from the Federal and local level, and how do you overcome that to encourage businesses to start. And I think Mr. Porter has mentioned an action that was just taken to encourage it.

Mr. PORTER. The targeted jobs tax credit.

Representative ROUSSELOT. It started when? It's been in place, but it hasn't been utilized.

Mr. PORTER. It has been in place, but it has not been utilized as fully as it might have been. It is part of the recently enacted tax bill.

Representative RICHMOND. I want to thank you all for coming this morning. It's been a most exciting and interesting morning.

Representative ROUSSELOT. I have one more question——

Representative RICHMOND. We would like to keep the record open for 2 weeks for any additional material we may receive on this subject. Go ahead, Congressman.

Representative ROUSSELOT. I'd like anybody to comment on this. Yamazaki was faced with declining sales of motorcycles and decided not to lay off U.S. workers. They are continuing to pay the workers and they tried to have their employees undertake public projects. Do you want to comment on private corporations paying employees to work on public projects. Are you aware of this? What is your thought on that?

Mr. HORMATS. I just read that in a newspaper article recently. I was very impressed by that because it does two things. One, it enables them to do something in the community which is positive and, two, when demand picks up, they've got a ready labor force which can go back without a new training regime. So I think that's very creative management.

Representative ROUSSELOT. It's very creative if they can keep the payroll going.

Mr. HORMATS. Evidently they think they can, and evidently they anticipate an increase in demand, so they felt this was better economics and better social performance than simply letting them off.

Representative ROUSSELOT. Are any of you familiar with it? Has it come up in your discussions?

Mr. LEVINE. No.

Representative ROUSSELOT. Do you want to comment on it?

Mr. PORTER. I wasn't aware of it before, but it doesn't take a great deal of commonsense to note that it requires a fairly healthy company to pursue that kind of strategy, particularly in the very long term. A company in laying off a worker has to realize that they have a high fixed investment in that worker, especially if they have already provided a good deal of training. They have him identified and he has some sort of attachment to the company. Moreover, they must consider whether he is likely to be laid off for a relatively short period of time. Three-quarters of the workers that are laid off in U.S. manufacturing establishments are ultimately recalled.

Representative ROUSSELOT. Seventy-five percent. Is that over a period of what years?

Mr. PORTER. That's in the last decade. The alternative to laying workers off is continuing to pay them and allowing them to do some useful public service, or in the case of some of the companies we saw in Japan, Sony, for example, giving them additional internal training during slack periods.

Representative RICHMOND. What happened to the 20,000 Hitachi workers?

Mr. PORTER. Hitachi was a very interesting example of where their volume of sales doubled during a decade in which their total work force declined from 180,000 to 160,000, most of which they did through attrition, although a big chunk of it, as you know, was in the 1972–73 period.

Representative RICHMOND. I believe a lot of this is relatively untrue. I think they used an awful lot of subcontractors and temporary workers and this lifetime employment business I believe is just a figment of somebody's imagination. Most American companies that have well es-

tablished factories have lifetime employment. I guarantee you that the average person who's been working in our factory has been working there all of his life. The president of our company in Reliance, Ohio, he and his father and his grandfather now represent 124 straight years working in that company. His grandfather was a machine man and his father was a foreman and this fellow became president. You find this throughout the United States. So if you have a viable company that's doing a halfway decent job, you're going to keep your employees there. Management isn't a damned fool. If you've got a man or woman who's well trained, you're not going to fire people like that unless you absolutely have to. I still recall that Hitachi—that suddenly 20,000 people disappeared and you can't lose 20,000 people in 1 year through attrition.

Mr. CYERT. I agree. I think your point is quite valid. I'm struck frequently with businessmen who raise questions about tenure at universities and can't understand it, and then you go and talk to people in their firm and you find out they have a concept of tenure. I think it's true in large numbers. I think the other point, however, is that we basically have a society—I think it's been one of our strengths—where we say that because of individualism, the uncertainties in the economy go back on the individual. We have been modifying that process through worker's compensation and a variety of other so-called built-in stabilizers to the point where maybe, to take this case that the Congressman was talking about, the difference between maintaining the person on the payroll and paying the unemployment compensation might not be that great. So that it may not be as great an act as it may look.

Representative RICHMOND. Thank you very much. Let me just leave you with the fact that I'm still worried about those two major items that to me are the problems we still haven't solved—capital formation and a literate, trained work force. Those are the things I think we need so badly in the United States and they, obviously, have them in Japan, and that's why they're beating us.

Representative ROUSSELOT. And an incentive for saving too.

Representative RICHMOND. A better incentive for saving and some type of arrangement with employers take the young people out of high school and train them in their factory. That's what they apparently do in Japan.

Mr. CYERT. Actually, one of the points that I did want to make on education was the fact that university education in Japan is really bad.

Representative RICHMOND. Oh, yes.

Mr. CYERT. The students work hard to get into good schools and once they make it they are guaranteed graduation and they really fiddle away 4 years.

Representative ROUSSELOT. But their trade schools are better.

Mr. CYERT. That may very well be.

Representative RICHMOND. Thank you very much, gentleman, the subcommittee stands adjourned.

[Whereupon, at 12:15 p.m., the subcommittee adjourned, subject to the call of the Chair.]

[The following information was subsequently supplied for the record:]

STATEMENT OF HON. JOSEPH R. WRIGHT, JR., DEPUTY SECRETARY OF COMMERCE

Mr. Chairman and members of the Subcommittee, I am pleased to submit my observations and conclusions on "Japanese Productivity and Lessons for America" resulting from our recent trip to Japan as part of the tour sponsored by the American Productivity Center.

To begin -- America will run about a $15 billion trade deficit with Japan this year -- the largest trade deficit with any country in our history -- so the U.S.-Japanese trade and competitive relationships are obviously important to us at this time.

Let me first describe some of the specifics of these U.S.-Japanese trade relationships.

Japan and America together account for one in every three dollars of global production. Together, we dominate the high technology area, producing as much as 80 percent of the total value of computers and semiconductors in the free world.

Japan's post-war economic growth has been remarkable. At the same time, its success has created trade problems for its global partners. Over the years, these problems have been the result of a Japanese market that has not been open and a Japanese export strategy that has concentrated on targeting and protecting a relatively small number of highly important high-growth and high-value added industries. At the same time, Japan has pursued a strategy of minimizing its imports -- buying raw materials and semi-produced goods and avoiding

imports of finished manufactures whenever possible.

These strategies led to extremely skewed trade patterns. 95 percent of Japan's exports are manufactured products, while 80 percent of its imports are agricultural commodities and raw materials. This has led to a growing trade imbalance that culminated in a $25 billion trade surplus for Japan in 1978. This is all the more remarkable in view of Japan's need to import almost all of its oil.

This trade imbalance has affected all Japan's trading partners, but particularly the United States, as we are Japan's largest market. U.S. trade with Japan has been in constant deficit since 1965 with a cumulative imbalance of around $60 billion. Last year's $10 billion deficit with Japan was 40 percent of our global deficit.

Unless we and the Japanese do something -- cooperatively -- this situation will worsen substantially. U.S. imports from Japan are now 50 percent larger than our exports to Japan. We find ourselves having to run faster just to prevent backsliding. Let me illustrate. Since 1970 our exports to and imports from Japan have each been growing at about 17 percent per year. If this trend continues, our present deficit with Japan will be close to $25 billion in 1985 -- and $50 billion in 1990.

It is up to both nations to take action to change present trends. This won't be easy. If the import growth from Japan

continues at its present rate, our export growth would have to accelerate by about one-fourth, to 21 percent per year, simply to maintain last year's $10 billion deficit.

Let's consider the question of Japanese market access. Some say all we have to do is to be more diligent in selling to Japan. While it's true that many American companies need to do a much better job in building a Japanese market, that isn't the fundamental problem. Last year we had a 34 percent share of the Japanese import market for manufactures. So, in comparison with foreign competitors for the Japanese market, we're actually doing quite well.

One major problem is that the Japanese import market for manufactured products is too small. While Japan is the free world's second largest economy, it ranks only ninth in imports of manufactures -- barely larger than Switzerland. Japan imports only $230 of manufactured products per capita, the lowest of any industrial nation. By comparison the U.S. imports $570 of manufactured products per person.

Japanese global strategies for the coming two decades are well documented. Japan has reached a consensus -- I do not believe it an exaggeration to proclaim it as a "national consensus" -- that its future lies in becoming a knowledge-intensive and technological economy; public and private efforts are moving in this direction. Japan's gains have been impressive.

For example, in the mid-1960's U.S. companies accounted for

80 percent of U.S. patents for telecommunications, but now that's down to about 60 percent. Japanese firms are up from 3 percent to about 15 percent. Japan has surpassed the United States in some technologies -- including robotics and some semiconductor devices-- and threatens to surpass us in more. Moreover, one of Japan's goals now is the creation of entirely new technologies, such as new materials and genetics.

I believe that Japanese past growth and future strategies are based on several factors -- some which we discussed on our recent trip overseas.

The Japanese government sets a growth plan and then supports and encourages business efforts to achieve the plan. Clearly, a much closer relationship exists between Japanese government and business than does between their counterparts in our country.

Japanese firms also have highly aggressive and competent management which generally operate on a long-term perspective. This contrasts with U.S. managers, many of whom are very short-term oriented. Furthermore, Japanese management is supported by workers whose assurance of life-time employment makes automation a more acceptable goal.

Japanese R&D is focused more on process development than on generic research so their risk of failure is lower than ours.

They have almost a 20 percent saving rate in Japan providing substantial capital for private sector investment. And since banks can own equity in companies, they are willing to take greater risks resulting in equity leveraging which is much greater than ours.

The Japanese, with an economy half the size of ours, last year invested more in capital equipment than did U.S. business. While U.S. productivity grew 28 percent between 1970 and 1980, Japanese productivity grew a phenomenal 102 percent. Last year the Japanese displaced America as the world's largest producer of automobiles. This followed Germany's displacing us as the world's leading exporter of manufactured goods!

In other words, the Japanese have created a total enviroment geared toward high-growth, competitive expansion.

In the face of such formidable competition, what should the U.S. do?

First, let's not panic. The U.S. economy is still the largest in the world, one-fifth of world production, and larger than the combined economies of Japan, Germany and France. We have all the ingredients -- good infrastructure, educated work force, sound agricultural base, the finest R&D resources in the world, and the highest level of productivity in spite of recent slow rates of growth.

Second, we should not copy the Japanese or anyone else just for the sake of trying something new, reaching for the "quick fix". Many of the people who visit Japan appear to want to "import" their "business, production and management system" in total. We cannot, and should not. Much of what has made Japan successful was learned from the U.S. in the first place. If we can learn from other nations, all good and well, but we

should import only those improvements that would apply in our own political, social and economic environment -- with reasonable changes as appropriate.

Third, the Administration's Economic Recovery Program is aimed at increasing U.S. competitiveness, and in providing the essential tools to restore our economic strength. Accelerated depreciation allowances coupled with retention of the investment tax credit provide a powerful stimulus for the expansion of investment and an increase in the proportion of our GNP that is invested. They also help make up for the advantages that foreign companies have had for some time. Japanese firms, for example, have been able to enjoy an extraordinary first year write off that, coupled with normal depreciation, allows them to recover about 45 percent of new equipment cost in the first year. With the new U.S. provisions, American companies can now recover nearly 60 percent in the first two years.

For equipment used for R&D purposes, the new U.S. law allows three year depreciation of equipment, and more than 80 percent of costs can be recovered in two years. In addition, firms can receive a 25 percent credit for increases in R&D expenses over the amounts spent during a base period. These provisions are very strong incentives, and should result in sharp R&D increases. A roughly similar Japanese provision, for example, has played a large role in the development of Japanese R&D.

The other elements of the Economic Recovery Program are also very important. Controlling and reducing government deficits together with a stable growth in the money supply will give us the low inflation and price stability so critical to our competitiveness and the development of long-term export relationship with foreign buyers.

Fourth, we should provide greater certainty to U.S. companies regarding the application of antitrust laws to joint export ventures. To achieve this, we urge quick passage of Export Trading Company legislation (S. 734 and H.R. 1648).

Fifth, being customer-oriented is more productive than being product-oriented. Nothing illustrates this more than the U.S. auto industry. They were so focused on maximum profits that even after their own surveys showed that 95 percent of the public preferred quality, economy and lower prices to new styling, they completely missed the greatest customer preference shift in the post-war period. Of course, this was complicated by the increase in gasoline prices -- but the Japanese were well positioned to take advantage of the shift.

Sixth, if we become customer oriented, we shall have a new respect for quality. For too long most of American business has followed Alfred Sloan's dictum that to gain market share, it is not necessary to have greater-than-competition quality. This American attitude has given the Japanese and Germans a great edge. As one Japanese manager noted, "We realize that

your willingness to accept 95 percent, is what makes us able competitors.

Seventh, despite short-run economic fluctuation, we must shift to a longer-term perspective. We all know of marketing strategies that have aimed at quick returns rather than shaping future markets; or earnings that have been distributed as profits or stock dividends that should have gone into plant modernization; or management energies that have been absorbed with keeping stock prices high to defend against acquisition. Such practices can hinder the attainment of a more favorable market position and competitive position over the long term.

Eigth, to compete in the world of the 80's and 90's, businesses are going to have to assume a global perspective. The days of limitation to a national market are over. This means that trade must become an integral part of corporate strategic planning. There are some 20,000 American firms which could be exporting, but are not. Twenty percent of the exports that do leave our shores are sent by companies owned by the Canadians, British, Dutch, Germans and Japanese.

Admittedly, the strength of the dollar is making exports more difficult just now. But nevertheless, with German, Japanese, Korean and French companies operating on a global scale, more American companies must develop this perspective or suffer.

There are some very important bills that are currently pending in the Congress that are geared towards assisting American companies to compete overseas. Quick passage is

vital. They include the Export Trading Company legislation (H.R. 1648, S. 734) and the Foreign Corrupt Practices Act (H.R. 2530, S. 708). It's time that our government, like the Japanese, helped rather than hindered U.S. companies in their effort to expand their overseas markets.

Lastly, business and labor must look at their relationship in a new context. The adversarial struggles of yesterday may have made sense within the framework of yesterday's domestic oriented realities. But today's realities are different. America simply cannot afford -- in dollar terms if nothing else -- the expensive waste of the adversarial mode of the past.

For management, this means a new awareness of and respect for the underutlized capacities of the American worker. Labor must be treated not as a "cost", but as a resource. For the worker this means a new sense of responsibility for the total production process and the final product.

Mr. Chairman, in closing, I would like to say that America has entered a new period of world economic development. It's a new age, and the leadership of this new age is up for grabs. No one is going to follow America just because we were great and powerful in the past -- the Japanese have already showed us that. We have got to renew that greatness and economic performance in each successive generation. That's the challenge to each of us as citizens, and I, for one, am convinced that we can do it.

Thank you for the chance to present my views here today.

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